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[ILLUSTRATED.]

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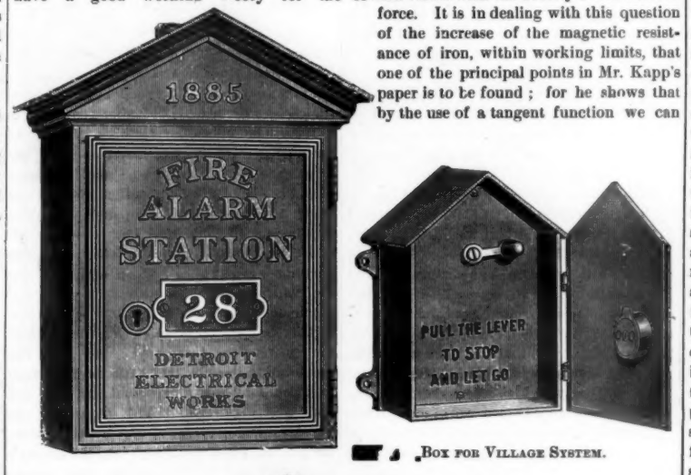
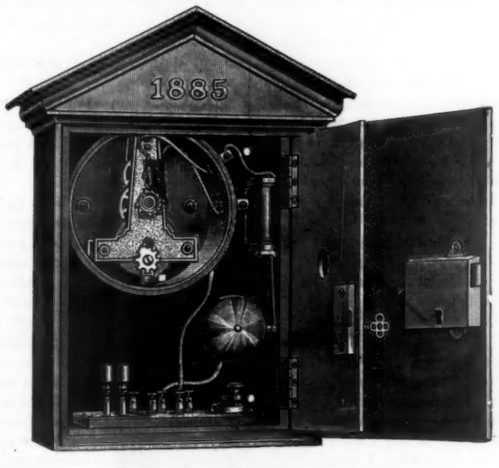
Apparatus Designed by the Detroit Electrical Works.

The Detroit Electrical Works have shown considerable progress lately in bringing out some new designs of electric bells which will be found illustrated herewith. The octagon bell has an iron frame, and is a very unique pattern. This company has also designed a new style of fire alarm boxes which will be found of interest to some of our readers. The cuts shown on this page represent their standard fire alarm telegraph box, the movement of which is contained within a small cylindrical box with a glass front. The gears are accurately cut and ground and the circuit breaker is perfect in its operation. To signal the fire department, it is simply necessary to pull down the hook. This gives a signal to the fire department and repeats the number of the station four times. This box contains a relay bell, lightning arrester, signal bell key, and is thoroughly protected from dampness, the movement and all the working parts being placed within a smaller box with an iron door.

The small box is used for village system and in warehouses, mills, etc.



Box for Village System.



Fire Alarm Telegraph Boxes.

The Pre-Determination of Dynamo Characteristics.

The Society of Telegraph Engineers is to be congratulated on having opened its session with a paper of great importance, and English electricians, still more than they have already been justified in doing, may regard with satisfaction the undoubted fact that, although this country cannot claim to have taken the first important steps from which the modern dynamo, by a singularly rapid growth and evolution, has resulted, it has completely vindicated its scientific reputation by leading the van in the subsequent development and improvement of the dynamo, both theoretically and practically. Mr. Kapp's paper, to which we refer, seems to go a long way in the direction in which progress has become especially desirable—the pre-determination of the characteristics of dynamos. Much has been done within the last few years to render the task of designing dynamos comparatively easy, but the work has been for the most part carried out by practical constructors in their efforts to improve their particular machines, and there has been a want of definite comparative data of a numerical character such as is absolutely necessary to foretell with even an approach to accuracy the manner in which a new machine will act. This reproach to electrical science is being gradually but surely removed, and we may confidently expect that in the course of a year or two it will be quite possible to tell not only how best practically to proportion a dynamo or motor in all its parts, but to state in definite and exact terms and units the proper dimensions and qualities of each part; and having done this to state with precision the behavior of the machine under any given conditions. Mr. Kapp's paper deals with the construction, beforehand, of what we may call the "idle" characteristic curve of dynamos. The curve of magnetization constructed by the method dealt with is in no essential respect different from the ordinary "characteristic" with which we are more familiar, and which exhibits the connection between the speed of a dynamo and its E.M.F. This curve and the relation which it expresses, although claimed on the other side of the Channel by M. Deprez, was, we believe, first studied by Dr. John Hopkinson.

We have no doubt that before long we shall be able to fully construct, by pre-determination, the full "working" characteristic of dynamos, or the curve displayed by machines when generating current. At present we may well be satisfied to have a good working theory for the construction of the "idle" characteristic or curve of magnetization, especially as in good dynamos the effect of induction by the armature current is comparatively small, and is likely to decrease as further improvements are made. It is perhaps a little singular that the more we know about magnetism the more we see that the analogy between the electric circuit and the magnetic circuit is in reality a very close one, and that the methods which enable us to pre-determine the flow of a current of electricity in a circuit when we know the E.M.F. present and the character of the various bodies which constitute the circuit, will, with equal certainty, enable us to pre-determine the flow—if the word, for the sake of the analogy, may be allowed—of magnetic "lines of force" in the region influenced by the presence of a magnet. We are able to say with perfect truth that Ohm's law applies equally to the two cases. The analogy is incomplete only in one respect, viz.: that while, at any rate for a metallic conductor, the resistance is a constant quantity—assuming its temperature to remain constant—for any density of current, the magnetic resistance of iron varies with the density of the lines of force. It is in dealing with this question of the increase of the magnetic resistance of iron, within working limits, that one of the principal points in Mr. Kapp's paper is to be found; for he shows that by the use of a tangent function we can determine the increase of magnetic resistance in such a way as to accord with experiment.

We trust that in the discussion of this paper, the question of the resistance of the air with special reference to leakage of lines of force may receive very careful attention. Professor Ayrton, in his remarks on this point, stated his belief that even for low degrees of magnetization, the resistance of the air is less than has usually been assumed in comparison with that of iron, and as on this resistance depends to a certain extent the proper ratio to be observed between the sectional area of field magnets and that of armature cores, too much attention can scarcely be given to it. If this resistance is low, then it follows that large pole-pieces, protruding a considerable distance from the magnetizing coils, such as are used in Mr. Kapp's own dynamo, are objectionable. A fortnight ago we published a paper by M. Marcel Deprez from *Comptes Rendus* on this very subject, and although in some of his claims of priority he is, as is not unusual, a little late in the day, the paper should receive careful attention in connection with the subject under discussion. Mr. Kapp assumes that, as regards air, the magnetic resistance is analogous to electrical resistance, being simply proportional to the ratio of length divided by area. M. Marcel Deprez, in the paper alluded to, while he does not exactly say that this relation is incorrect, affirms that the intensity of a field decreases much less rapidly than the distance of the pole-pieces increases. He makes what appears to us to be a contradictory distinction between a field, the poles of which are separated simply by air, and one in which an iron armature is comprised; and describes, or rather alludes to, some experiments which are equally contradictory. In one case the intensity of the field existing between the two poles of an electro-magnet was only reduced by one-half when the air space was increased ten-fold. In another case the intensity of the field maintained between the pole-pieces and an iron armature was more slowly decreased, falling from 1 to 0.6 for a four-fold increase of clearance. In the absence of full particulars it is impossible to attempt to criticise these statements, but it certainly appears on the surface as if M. Deprez had been experimenting with electro-magnets, the cores of which were so highly saturated as to offer a considerable resistance in themselves.

There is one statement in this paper of M. Deprez's to which we venture to allude, as it involves a question of priority of invention or discovery, or at any rate of application, which we are now in a position to settle, thanks to the letter of Messrs. Mather & Platt, published in our last issue. M. Deprez, in the article alluded to, says:

"I was the first to construct very thick and short electro-magnets (experiments in the depot of the Northern of France Railway in February, 1883), instead of employing electro-magnets of small diameter, long and numerous as was done in the Edison machine which figured at the exhibition of 1881. My example has been followed with full success, and the magnetic field of the Edison machines since constructed has been considerably improved simply by decreasing the length of the electro-magnets and thickening the core."

We quote the passage in its entirety, because it is desirable that M. Deprez should be allowed to state his own case. We, in England, have been in the habit of connecting the improvement of the Edison dynamo with the name of Dr. Hopkinson, and, as we now know, with perfect justice. For it appears from the letter of Messrs. Mather & Platt, that as early as the autumn of 1882 Dr. Hopkinson first experimentally demonstrated the advantages of the altered form of the magnetic circuit of the Edison dynamo;

that early in December of the same year he gave instructions for a dynamo on the improved lines, which was constructed and tested with most satisfactory results early in January, 1883; and that machines involving the improvement were actually delivered for commercial use in the following March. Our readers will doubtless recollect that this matter was first given public prominence by Dr. Hopkinson in a lecture at the Institution of Civil Engineers on April 5th, 1883, at which time M. Deprez had not, so far as we are aware, made any announcement on the subject We therefore see that the example which M. Deprez correctly says "has been followed with full success" is certainly not that of M. Deprez; although we are quite willing to allow him the degree of merit to which, according to his own statement, he is fully entitled, namely, that he was only a few months behind Dr. Hopkinson in this matter. And this is no slight honor, and one with which others than M. Deprez must make shift to be satisfied.

But whatever may be the case with regard to the magnetic circuit of the dynamo, we need not remind those of our readers who have not lost all interest in the less bulky electrical apparatus, that the substitution of short thick magnets for long thin ones is an improvement which was made in telegraphy a good many years ago. Who does not remember the long and slender legs of the Morse "embosser," and all its kin, with their tight-fitting trousers of green silk-covered wire; or who can forget the respect inspired by the appearance—some twelve years ago—of the sturdy little electro-magnets which replaced them, and which owed their exceeding vigor to the very improvement which M. Deprez with so little justification is now claiming as his own?

But we are wandering from our subject, to which we will return only for a moment to say that we hope the claims of the "practical" workers will not be forgotten amidst the din of contending mathematicians. Mr. Crompton, speaking on Mr. Kapp's paper, put in a timely word for those who, although perhaps incapable of integrating a curve to zero, are possessed of what he calls "an eye," and who have been able, by the unaided assistance of that useful organ, to carry out exceedingly useful improvements.

But our readers will be aware, from the paper on "Dynamo-Electric Machinery," by Dr. John Hopkinson and Dr. Edward Hopkinson, which we are reproducing from the *Philosophical Transactions* of the Royal Society, that the questions dealt with by Mr. Kapp, and other questions connected with the dynamo, have been very fully dealt with some months ago. It is much to be regretted that owing to the manner in which the Royal Society fails entirely to appreciate the value of time in matters of modern science, especially in science which has an immediate bearing on industrial progress, the invaluable paper by the Drs. Hopkinson, which was read in May last, is only now available for study. We cannot now do more than allude briefly to this paper, in which will be found not only many theoretical considerations bearing on the "pre-determination of dynamo characteristics," but also many practical experiments of an exceedingly interesting and important character. For instance, the ratio of the total induction to the induction in the armature was determined experimentally, and it was found that for an Edison-Hopkinson dynamo, of the total lines of force passing through the cores of the magnet limbs at the center, $\frac{800}{1000}$ go through the core of the armature. Again, the routes by which the waste lines of force were lost were examined, and the losses in the various directions are expressed as percentages.

As the authors express it, these investigations appear to "tell the whole story of a dynamo machine," and we may safely anticipate, as a result, a considerable practical improvement in such machines all along the line.

One interesting consideration we may allude to in conclusion. It is shown that in a generator it would be possible, but for the sparking which would ensue, by making the angle of lead negative, to thereby obtain, by the reactions of the armature itself, all the results usually obtained by compound winding.—*London Electrical Review.*

The End of the Bent Suit Against the Erie Company.

A REVIEW OF THE ISSUES INVOLVED AND OF EVIDENCE.

The hearing in the Erie telephone suit was resumed at the court house in Lowell the 20th ult., before a goodly attendance of interested persons. Hon. George F. Richardson at once began his argument for the plaintiff. Said he: A number of years ago I was invited to witness an exhibition of a new invention in a public hall in this city. On that occasion a gentleman named Bell exhibited what seemed to be a very remarkable invention, by which we were enabled to hear conversation, and also the pealing of an organ, in Boston. At that time there was probably not a single person who believed that the invention would ever be of much practical use in the world. But not long after this a corporation was organized to test the value of the invention. Wires were placed in position in Lowell and a telephone system established here. Among the first promoters of that enterprise was

THE FIRM OF GLIDDEN & CO.,

composed of Glidden, Ingham and Downs. It was organized with a capital of $15,000 and grew until it was absorbed with other companies into the New England Company.

The basis of every one of these corporations was an invention, neither more nor less. The Bell company to-day, with its capital of $20,000,000 has for its basis a patent issued by the United States. Why was this sufficient justification to place the capital at the high figures at which it has been placed? Simply because the patent was of that value. In every case when we speak of the value of property it depends upon its earnings. Land increases in value in accordance with the changes in its surroundings and circumstances. Within the memory of living citizens land in Lowell that was once worth $50 per acre is now held at $1,000,000 an acre. Land in Dracut which a few years ago was worth $100 an acre is now worth many times that amount, because of the building of the Aiken street bridge, very properly called so, for it makes the hearts of taxpayers ache. So it was in these telephone transactions. It seemed at one time as if the men of Lowell had lost their heads on telephone. Men of the highest character engaged in the business—doctors, lawyers and merchants—and nothing was said against it at the time. I don't know of a man in this city or in any other, who, if he thought he could honestly get two dollars for one, would not do it. Much has been said about this watering of the stock; the increase in its value was legitimate. The increase represents the increased earning capacity of the invention.

There is no business enterprise on earth which, after it has been carried on for a time, will not develop things that were never thought of. So it was in railroading, and so it was in telephoning. It was at first thought that when a telephone line was constructed it would endure for many years. This was found not to be so, and much of the money received had to be put into needed repairs.

I propose to state what I conceive to be

THE EXACT ISSUES

that we are called upon to try in this case, to cite the authorities bearing upon these issues, and then to speak of the evidence. First, in regard to the services of Mr. Bent to the various companies. Did he perform services for which a charge was to be made? If he did, did he perform them under such circumstances as to warrant his receiving pay? If so, what were those services worth, and has he lost the right to recover for them? I propose first to call your attention to the question of the note, because out of all this mass of relevant and irrelevant testimony there is no dispute as to the facts of the note. The only question is one of pure law. The facts are that Mr. Bent at various times loaned the Erie company sums of money aggregating $8,000. For this the Erie Company gave him their vote. Mr. Bent was anxious to get his money, and accepted $7,000, and returned the note, expecting that the matter would end there. Is it permissible for him under the laws of Massachusetts to recover the balance? Secondary evidence with regard to the note has been introduced, as the defense refused to produce it. To the admittance of this General Butler took exception. The note was a demand note carrying interest; its payment had been demanded, and a portion of its value accepted. It is a rule of law that no promise to do anything is valid unless there exists a valuable consideration for the promise. A less sum of money cannot be satisfaction for a greater. If a creditor accepts the part payment of a note not due, then there is consideration, for you have no right to collect a debt before it is due; but if the note is due when demand is made for it, as was the case with these notes, then it is a different matter.

Mr. Richardson cited numerous authorities in which it was shown that decisions had been given in Massachusetts courts sustaining his claim Said he: It has been claimed that the giving up of the note was a good and sufficient consideration. But who was to receive the consideration? Was it not Mr. Bent? But the other side received the note and Mr. Bent received no consideration.

Passing to a consideration of

MR. BENT'S SERVICES

for the Northwestern and Southwestern, Mr. Richardson quoted from the testimony. Bent was employed under such circumstances as to warrant the belief that he was to receive compensation for his services. At the formation of the Northwestern Company he gave advice for which he made a charge of $150. Mr. Bent had testified that he was never an officer of this company. He gave up his private business and devoted his entire time to the duties of attorney to the telephone company. For an opinion upon the contracts of the Southwestern Company he made a charge of $250. Upon the legality of these contracts rested the value of the entire Erie Company. He gave the opinion that the contract with the American Bell Company was a perpetual one, and did not expire in 1890. With regard to the purchase and transfer of the Southwestern, the plaintiffs had tried to go into the enemy's camp and get hold of books and papers which had been needed, but they had been shut out.

Gen. Butler—We offered to produce the original books.

Mr. Richardson—You tried to put in a document to which there was no attesting signature, not even that of Charles J. Glidden, and that is bad enough. It was another book that I wanted.

A long argument has been made, said Mr. Richardson, that Mr. Ingham hadn't the right to sign the transfer of the Southwestern Company; at the meeting he simply acted as clerk. The transfer was made in the presence of all the interested parties. As to the legality of the transfer, I will not take up time in its discussion. Mr. Richardson referred the arbitrators to the case of Mr. Croninshild, who some years ago held the two-fold position of president of the Boston & Lowell and Nashua & Lowell Railroad Companies. Would any one claim that he couldn't have signed an agreement to sell one road to the other if so authorized?

At this point a 10 minutes recess was taken.

Resuming, Mr. Richardson said that the arbitrators were a tribunal clothed with all the equity powers of the Supreme Court of Massachusetts, and they are practically without limit. When the Northwestern and Southwestern companies sold out to the Erie company they took an obligation from the latter to

ASSUME ALL THE OBLIGATIONS

of the consolidated companies. No judgment against the old companies is needed by Mr. Bent before he can recover from the Erie Company. A judgment is merely the evidence of indebtedness, and indebtedness has been already proved. A fact may be proved in forty ways, but after it is proved that is the end of it. It would not be in accordance with equity to compel Mr. Bent to proceed first against the old companies, because it was not right to put a creditor to needless expense in obtaining his claim. Every case cited by the defense had shown that the plaintiff had no remedy in law because he had a remedy in equity.

As to the claim of Mr. Bent for compensation for services rendered the Erie Company there were three questions to be considered: (1) Was he employed by the Erie Company or their executive committee? (2) How, having been so employed, did he transact their business? (3) Was he employed under such circumstances that the law would compel an obligation?

For proof that Bent was employed as attorney by the Erie Company Mr. Richardson referred to the testimony given in the earlier days of the trial. Mr. Bent gave up his private business and devoted his entire time to the business of the Erie and New England companies. The executive committee of the Erie Company, consisting of Ingham, Downs and Glidden, requested him to do the company's business. It was voted by them to refer a certain legal question to Mr Bent, with the request that we prosecute. Mr. Bent's name was put upon the company's letter-heads and on the glass door of the office. If Mr. Bent was not then attorney, why should they ask for his resignation? As to the manner in which he was employed, and whether any agreement was made whether he should make any charge for services or not, in the light of the fact that before the Erie was formed Bent was employed by the same men for whom he afterwards did business, would it be necessary or likely that they would say to him that they were going to employ him and would pay him for his services? The set-off of $112,000 contains forty or more items and is ridiculous; it seems

LIKE MERE BUNCOMBE.

Of these items one was for the recovery of two months' salary paid Bent. This was strong evidence that he was employed by the company and paid a regular salary. Gen. Butler has asked if Bent had a claim for salary why he did not present it. It has been shown in Mr. Bent's cross-examination that he didn't ask the company for payment of salary because they owed him a note, and to take salary would simply be taking money from one pocket and putting it in another.

Gen. Butler has himself referred to the Hon. Francis Jewett as a gentleman of the highest respectability. This gentleman's testimony fully corroborated that of Mr. Bent in regard to what he said to the directors about his salary. The last words of Mr Jewett on the stand were that there was one thing additional that he should like to say, namely, that Mr. Bent said to the directors in his presence that if things went on as they then were he should make no claim for salary. When Mr. Jewett said this I looked around on the faces of the directors present in the court-room who had been on the stand and sworn that they could not remember this remark, and thought when they got Mr. Jewett alone how they would swear at him, except possibly one gentleman (looking fixedly at Mr. Glidden), whose morality is such that he can take money out of the treasury of the company and keep it—I don't think he swore.

From the Arkansas transaction Mr. Bent received $2,000, but he thought it a present from Mr. Ingham. When he ascertained the truth he paid that money back, although he was bound neither in law nor in equity to do so. Contrast his conduct with that of Glidden, who sends $2,000 to Dyer and Temple, and declines to pay back the money when the others do. From the testimony of both Bent and Glidden, it has been proved that Bent never saw the pool book of this transaction. General Butler has claimed that the receipt for $7,000

WAS A FORGERY.

This, for the sake of argument, I admit. If so, what was the motive for the forgery?

Whose motive was it? It lies between the two men, William H. Bent and Charles J. Glidden, who were the only men who had anything to do with it. Bent has sworn that he gave it to Glidden unsigned. It was here seen from the evidence in the case that Mr. Bent drew all his papers with great care. Glidden testified that he put in in pencil the date "28" and the word "Ark" in a document, and sent it to Bent to have it put in in ink. This Bent refused to do, thus exercising more than ordinary care—more scrupulous than an ordinary practitioner. So far as the evidence put in in this case goes, there isn't a blot on the character of Mr. Bent. Who had the motive for this forgery? Gen. Butler has asked, "Wasn't there an auditing committee appointed about this time?" Where did he get his information upon which to base his question except from Charles J. Glidden? Bent was the man to be accommodated. Would Bent have laid himself liable by doing this for his accommodation? How does Glidden stand before this board as a man who would be likely to do this thing? Glidden swore that he heard Bent testify on the stand that he never saw Logan H. Roots, and on cross-examination he reiterated it. I don't wish to misrepresent Glidden's testimony, for it is black enough already, so I will read it.

The records showed that to the question, "Did you ever see Logan H. Roots write?" Bent replied in the negative. In the typewriter copy the word "write" was accidentally omitted. Glidden examined the records, and finding this answer went on to the stand and swore that he heard Bent swear that he had never seen Roots. There never was a piece of testimony so clearly and beyond all doubt manufactured as that of the testimony of Charles J. Glidden. He admits on the stand that he falsified the books. So that if a man can falsify vouchers and commit perjury, he would commit forgery! He then tries to lay it on Bent, who would not countenance a slight change in an executed document. On the question of retaining a salary from several companies, Glidden says that he had grave doubt of his "moral right" to do so. This is like the story of the two darkeys who were robbing a hen roost. Says one: "Say, Sambo, is dis right?" "Dat's a great moral question; hand down anoder turkey." [Laughter.]

THAT'S THE KIND OF A MAN

Charles J. Glidden is, for at the very moment that he stood on that stand committing perjury, the dollars thus obtained without moral right jingled in his pocket.

Mr Ingham engages in the telephone business in Lowell. Glidden comes to him and says that he should like to take a share in the venture with him, and that he thinks he can get $300 from a female relative. Ingham tells him not to mind about the money; that he will admit him to a third interest, and take his note for the amount required. Glidden was not worth a dollar in the world, and if the enterprise had proved a failure, Ingham would have been forced to meet the loss. I say that to Mr. Ingham Charles J. Glidden is indebted for the very liveries which his servant wears when he drives through the streets of Lowell. How does Glidden repay this kindness? By seeking to blacken the character of the man to whom he is indebted for all he is worth in the world. He testified that Mr. Ingham said that he hired an attorney to keep him out of State prison. But scared out of his boots, or rather out of Ingham's boots, he tones it down and says it's a joke. This has been introduced again and again, until it has become as stale, flat and unprofitable as Limburger cheese.

Gen. Butler—That is not flat.

Mr. Richardson continued: I remember once reading Dante's Divine Comedy, in which Dante describes the infernal regions. They are divided into nine circles, each of which are smaller than the other, and which are placed in form of an inverted cone. In the first circle are the souls of those who have committed the lesser crimes, and in the apex, in the narrowest, most contracted circle of all, are the souls of those who have betrayed, by the basest treachery, their best friends. Here Satan himself presides, and on his right hand sits Judas Iscariot. There may have been some mitigation for Judas, for he was certainly to get thirty pieces of silver for his treachery. Benedict Arnold may have had some excuse for his treachery, for he became a traitor while smarting under some fancied wrong at the hands of the American Congress. But it has remained for Charles J. Glidden to cap the climax and prove himself the blackest of traitors, without the slightest motive that I can conceive

EITHER BENT OR GLIDDEN

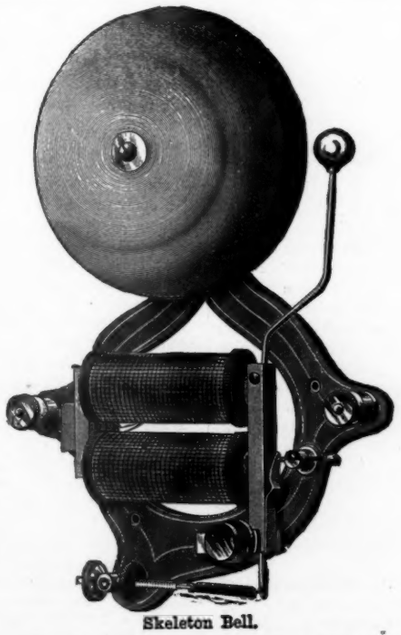
committed that forgery, and Glidden would take any course to throw mud on those with whom he was associated. But the betrayal of Christ by Judas Iscariot did not stay the progress of Christianity, and although Benedict Arnold was a traitor, American liberty still lives. Arnold was present in a private box at Drury Lane theater in London, and when the audience became aware that he was there they arose and left the theater to a man This is the estimation in which all men hold traitors, and so it will be with Glidden. When these cases are over not a man in the Erie company will wish to retain him in their employ. They keep him now to use him as a tool; but when they have got out of him all that they want, they will do what is done with all tools, kick him out.

At this point Mr. Richardson asked for an hour's adjournment, as he was suffering from hoarseness. Gen. Butler objected, as he had to leave at 2 o'clock. A five minute intermission was taken.

Resuming, Mr. Richardson spoke upon the point whether Mr. Bent could legally recover. A number of cases have been cited, said he, to show that the officers of a company cannot trade with that company. Mr. Bent, with the exception of seven or eight days during which he was president as a mere formality, was never an officer of any of the companies. He was an attorney, and an attorney is not an officer. The decision in the case of the Western Union Telegraph company, upon which so much stress has been laid, was rendered by a court of the same standing as a municipal court of Massachusetts. Mr. Bent could not be expected to know of this decision, for it was not published till 1884, a year after the sale of the Southwestern. The Erie directors in the trial of this case have committed hari-kari; taking as a knife the eminent counsel on the other side they have cut themselves all up. He has argued that there is no such corporation as the Erie Telephone and Telegraph company, for there was nothing legal in the steps taken towards its formation. Do you suppose if this were true that the learned counsel would attempt to come here and utterly kill the value of the property which the directors have had placed in their hands as trustees, merely for the sake of defeating Mr. Bent in this case? This is too absurd.

Box Bell.

Box Bell. (Internal Mechanism.)



Skeleton Bell.

NEW STYLES OF BELLS DESIGNED BY DETROIT ELECTRICAL WORKS.

THERE ARE TWO WAYS

of assenting to a consolidation—by an assent of the stockholders in writing and by a vote in a public meeting. Why should it be held that the signatures to the agreement must be obtained in a meeting, when it is evident that a vote is equivalent to a written consent?

I see nothing under heaven left of the defense made except in so far as they have been able to prejudice your honors against Mr. Bent. They have raked and scraped everywhere on the face of the earth for everything which might have a tendency to prejudice your minds against him. They even obtained possession of Bent's private bank book to pore over it by the light of the Erie Company's gas. Yes, they have done this, to see where and under what circumstances he has ever drawn money. When they wouldn't give it up when we asked for it, it would seem that they had struck a bonanza, but strange to say we have never heard anything about that bank book since. They have never been stopped by the sanctity of the home or the greater sanctity of the grave. They have thrown it in the face of a struggling young man who was not blessed with the advantages of a collegiate education enjoyed by some of us, that he set type while studying at his chosen profession of the law. He is admitted to the bar and begins practice. Of his legal acquirements it is enough to say that the highest court in the land selected him as the counsel to defend a man whose life was at stake. He comes to Lowel from Newburyport and opens an office. As we all know, the first years of professional life are years of bitter discouragement. The best of us, even the eminent counsel on the other side, were very willing and happy to accept $5 for trying some case before the Police or Justice Court.

THEY HAVE THROWN IN THE FACE

of this young man that while he was striving to succeed in his profession he sang in church and at funerals; and not content with that, they put in evidence that his wife also sang at funerals. Did any of you ever happen to stand beside the newly-made grave of a dear friend of yours and hear the voice of that wife, as I have heard it, would it not have softened your feelings to know that she was a wife so good and kind as to aid her husband in his endeavors and his troubles. God bless that woman! I should be proud to say that when I was struggling to make a place for myself in the world my wife stood by my side and contributed to my success by aiding in the support of my family. If any unfair inferences are to be drawn from this, let them be drawn.

They have proved that Bent lied about his age at the time he enlisted to go to the war. Is there anything smaller than that? It is as small as that apex of the infernal regions where there are only three. It was necessary either to get the consent of his parents or say that he was of age. He wanted to join the army simply as a private soldier, where nothing was to be won. He told the lie and "the accusing spirit which flew up to heaven's chancery" with the lie "blushed as he gave it in, and the recording angel, as he wrote it down, dropped a tear upon the word and blotted it out forever." When motives are passed upon this will be so placed to his credit that it will outweigh a multitude of sins.

I have addressed the court to-day not merely as a lawyer, but as a personal friend of Mr. Bent. For 20 years I have been in and out of court rooms in his company, sometimes on the same side as himself, sometimes opposed to him. We submit our case to you, Messrs. Arbitrators, knowing that it will receive ample justice at your hands.—*The Lowell Times.*

ELECTRICAL REVIEW

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We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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Mr. C. C. Haskins, 118 LaSalle Street, Chicago, Ill, will represent the REVIEW in the West.
Messrs. Wm. Dawson & Sons, 121 Cannon Street, London, England, are our representatives for Great Britain.

NEW YORK, DECEMBER 11, 1886

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Thos. B. Doolittle, Esq., of the American Bell Telephone Company, has resigned his position as secretary of the American Telephone and Telegraph Company, of New Jersey, and also as director in the American Telephone and Telegraph Company, of Pennsylvania, and will hereafter have his headquarters at 95 Milk street, Boston, Mass.

Of the common notion that electricity plays an important part in the production of earthquakes, Prof. Joseph Le Conte well says: "I never heard or read the slightest scientific proof of this theory. Electricity has taken hold of the popular imagination, so that any inexplicable thing is explained by 'electricity.' For example, vital force, nerve force, etc., are inexplicable, so many lay it to electrical force.

Our Chicago correspondent says that they are proud of the B. & O., and appreciate what it has done in the way of evening up rates, and the annual report of the president of the company tends to show that this appreciation has been general all along the line. He says: "The increase in the earnings of the Baltimore and Ohio Telegraph Company for the fiscal year ending in September, has been 172 per cent., compared with 1884, and 41.25 per cent. compared with 1885. In the midst of acute competition the large and increasing patronage thus commanded demonstrates the strength of the company, and the value and efficiency of its service."

For many years the freaks of the Boston Common Council have furnished amusement for the good people of the Hub. So many startling schemes have started in that august body that the citizens of Boston, after seeing new men of undoubted common sense and dignity soon after election fall into the ways of their predecessors, have been led to think that some hidden power was possessed by the City Hall and its appurtenances. This last week the Boston Electric Company turned the current from one of the lines connected with the Ferdinand street station to 18 Regina Sun Company's lamps of 125 candle-power, each placed in the Council Chamber of the City Hall. One electrolier in the center of room was made expressly for the place. Extensions to gas brackets on the other parts of the room are provided with Regina lamps. In all 98 gas jets are displaced besides numerous Argand lamps on desks and tables. So hot and impure was the air in the room when gas was used that business sometimes could hardly be transacted. Now the room, many times as brilliantly illuminated as before, the air is cool and the room exceedingly pleasant and attractive. It is now expected that the Common Council will be the model legislative body in this country. It is whispered among medical fraternity that certain councilmen are hunting for the periodical headache they used to experience after every council meeting.

SOMETHING FOR SCIENTISTS TO DECIDE.

A curious phenomenon in connection with atmospheric electricity—or at least usually attributed to that cause—was, on the second of November last, made the subject of a note presented to the French Academy, by Mr. Meunier. Mr. Maurice Gourdon, of Luchon, who holds high rank as a geologist, had presented several specimens of a peculiar substance, assumed to be the residuum after the explosion of a thunderbolt. The specimens are in the form of drops and translucent plaster, of a brownish color, having a vitreous luster, and the texture of bubbles. The substance in all the specimens is shown to be identical by the fact that it presents the same appearance, regardless of the material upon which it is deposited. In this regard it differs from a true fulgurite, which is the result of fusion, and necessarily partakes of the nature of the substance composing it. The matter under consideration appeared identical, whether found on schist or lime rock, or on the bark of trees.

Mr. Gourdon's note accompanying the specimens, says that "on the 28th of July, 1885, about 1.30 P. M., a gentleman going from Luchon to Bigorre, when about 150 meters from the bridge of Monsqueres, heard loud rolling thunder, and saw a bolt of lighting descend to the earth at a distance of only about twenty meters from him.

"Prompted by curiosity, he returned to the spot, and discovered that the wall along the route to the bridge, composed of schists and limestones, was plastered with a substance of a brownish color. The maples also were marked with the same substance. Conducted by the gentleman, I went the following day, and collected specimens of bark, schist and limestone, all smeared with this brownish plaster-like matter. Previous to the 28th of July I had never seen anything peculiar upon these trees or stones, and these deposits seem to me to date from that occurrence."

An examination of the specimens strengthens the theory of the meteoric origin of the substance. Covering several centimeters of surface, it is nevertheless quite thinly deposited. In color, brown, sometimes nearly black, very brilliant; in many places the substance has penetrated several millimeters in the cracks of the stone. It has a fibrous appearance quite remarkable. It may be drawn out into filaments as fine as horse hair; but heated upon a platinum plate it burns without other odor than that which pertains to the resins. Where circumstances favored such formation, the substance aggregated into minute drops, suspended by almost microscopic threads.

One specimen was shown where the deposit was unusually thick, and the stone blackened by carbon as if the resin had partially burned, after its contact with the rock. On the bark of the maples the deposited matter in the form of drops, sometimes measured as much as nine one-thousandths of a meter, and other deposits were hardly larger than microscopic points. One of these pieces of bark has the appearance of having been powdered with resin, mingled with an abundance of long filaments, which are absent, save where the bark has been thus sprinkled. The fact that the bark is everywhere intact, is convincing proof that no great amount of heat was present at the time of the deposit. The resin was deposited upon the fine leaves and threads of moss growing upon the trees, without disturbing the minute vegetable organism save covering it with the resin. In all cases there are many minute bubbles present, and from the surface bristle intercrossed fibers. These fibers present an appearance not unlike that seen in the exterior markings of divers meteorites, and especially those known as enkrites.

The resin softens by friction; burned in a lamp it gives off a characteristic resinous odor, and much smoke. Heated in a closed tubes over an alcohol lamp, it is distilled, and a considerable carbonaceous residue remains; an acidulated water is condensed, small colorless drops are formed, which partially crystalize on cooling, and a light-colored resin deposited, nearly analogous to the original. This last is soluble in alcohol, and especially if this latter is heated, and may be precipitated by water.

The fibrous deposit dissolved in alcohol becomes homogeneous, and a microscopical examination shows an almost perfect identity with the atmospheric powders so well known, and various traces of organic life. These are evidently imprisoned by the fluid mass, and have not the same origin as the resin.

Similar phenomena have been mentioned from time to time, and are to be found in "the philosophical works of the Honorable Robert Boyle, Esq., vol. III p. 32," a work of the last century, cited by Arago, in his "*Notice sur le tonnerre.*"

The 24th of July, 1681, about 3 in the afternoon the vessel Albermarle, sailing 100 leagues from Cape Cod, was struck by a storm. A thunderbolt descended, striking the yawl, which hung from the davits, the shock being accompanied by the deposit of a bituminous matter having the odor of gunpowder, and which was completely consumed, despite the efforts of the sailors to extinguish it with water and billets of wood.

In many instances of ball or spherical lightning the presence of this same resinous substance is noted, which is more or less slowly burned, with the odor of sulphur, resin or bitumen, and sometimes emitting a black smoke. The residual carbon preserved on one of the Luchon specimens showed clearly that this condition had obtained there, and that some fortuitous cause had extinguished the combustion before it was complete.

It has been claimed that these deposits are not a sequence of electrical exhibits, but are the result of explosions of some forms of meteorites. Numerous cases are mentioned where viscous residuum has been found succeeding such explosions. But it is only in catalogues—not in collections, that these are shown. The close connection between these meteorological displays of whatever their nature, and their near kinship to electrical phenomena, renders it extremely difficult to trace the line of demarkation between them.

In any event, whatever the origin, the deposit of resin from any meteorological display is of deep interest to the student of nature.

One pound of coal, according to recent Franklin Institute tests, will yield an amount of light averaging 150 candles with the electric arc light (about 60 per cent. of this if glass shades are used) 20 candles with incandescent lamps, and 14 to 17 candles with gas. In this estimate it is assumed that steam coal is burned under a good boiler for the electric lights, and that the gas is obtained from a bituminous coal.

CHICAGO ELECTRICAL NEWS.

The U. S. Circuit Court on the 29th of November decided a telegraph case which is of interest to the public generally. A creditor at Memphis, Tenn., telegraphed his lawyer as follows: "A. B. owes $6,000. If grounds, attach." A similar dispatch was forwarded later by a second creditor to the same attorney. The second dispatch, arriving first was acted upon, the attachment laid, and the second creditor took all there was of the effects attached, leaving nothing for the creditor who sent the first dispatch. This party sued the Western Union, and the court held the company liable for the debt. Judge Jackson, delivering the opinion, said the dispatch bore on its face the evidence of its importance.

Terre Haute, Ind., is to be honored by being given a seat among the experimental signal service stations, the first west of the Allegheny Mountains, and the fifth in point of number in the United States—the remaining four being located at Yale, Harvard, Cornell and Washington. Sergeant McRae will have charge of the new station, and will at once commence his investigations of atmospheric electricity, temperatures and meteorology generally.

A statement which appeared to be instigated by spite or a poor quality of baking powder, was made recently, by an evening paper here, to the effect that F. H. Tubbs, district superintendent of the Western Union Company here, was to be sent to St. Paul to relieve Mr. Mc. Michaels. Both Col. Clowry and Mr. Tubbs state that there is no foundation for the rumor, which is untraceable to any responsible party, and both parties speak of the gentleman whom the rumor was evidently intended to injure, as one, than whom there is not a more efficient man in the company's employ.

The weather of the past few days has brought the thermometer to the surface. A thorough investigator and statistician says that from actual observation he is convinced that in the summer season the average liar looks at his thermometer from below, while in the winter he views it from above. In no other way, says he, can I account for these abominable stretches of the truth.

The first morning of the present cold snap, when the thermometers in the signal office and every well regulated drug store said one and a half to two below, the street car passengers suffered with cold feet and ruby tinted ears, and believed the half had not been told when seven, nine, or twelve below was vouched for.

The cold wave was no weakling, however. It covered the Atlantic, Middle and Gulf States. On the 2d, Washington, D. C., had it 17° all day. Northern Minnesota 20° below, while further north it was still colder. At Manitoba the mercury was 35° below; at Clinton, Iowa, the Mississippi had six to ten inches of ice, and the thermometer registered 12° below.

That Marshall telephone has again been described, and the clearness of the explanation is so crystallic, so to speak, that it is worth copying. "It depends for its acoustic interpretation of electric pulsations upon the alternate cobering and separation of sheets of ordinary tin foil and paper arranged as a condenser." A continuation of the article says:

"The principal advantages of the new telephone are said to be its great simplicity, its perfection of operation, and the cheapness of its construction. Unless the courts shall decide that neither Marshall, Gray, nor any one else has any right to invent telephones or discover new methods of transmitting sounds, or have anything to do with telephones, without Bell's consent, it looks as if Marshall had discovered something of great value. Even then, there is the added danger that this vast crushing monopoly may reach out and absorb it, as it has others. In such case the Government will have to step in and shorten the life of the patent, or pass some general law conferring the right to manufacture under any

patent by the payment of a reasonable royalty, or quietly let Bell have the earth."

While in this connection, here is another interesting development of much the same nature—or rather in the same general direction of antagonism to the "vast, crushing monopoly."

Suit has been commenced by G. W. Cothran, of Chicago, and other parties in the State of New York, to restrain F. H. Brown from disposing of a patent, and compel him to carry out a contract. Brown invented some improvements in "magneto-telephonic" apparatus, and subsequently contracted with plaintiff and his associates to create a corporation to sell the Brown magneto-telephone inventions. Brown refused to carry out his part of the contract, and sign for stock, but is thought to be negotiating with other parties—possibly with magicians who can better aid the Government in preventing Bell from getting "the whole earth."

An excellent opportunity for making money is open to all these opponents of the monopoly, who are desirious of compelling the unfortunate possessors of the telephone business to pay tribute, on the socialistic principle. It's like the condition of things in the old nautical ballad :

> "Mollie Ward and I fell out.
> What d'ye think it was about?
> She had money and I had none,
> That's the way the row begun."

The scheme for these chaps to make lots of money is to wait, before they expend anything in fighting the wicked Bell people, until after the Supreme Court has decided upon the merits of the case, and then count up how much they have saved by keeping out.

The latest invention of the enemy—and, by the way, the Chicago daily, which is so full of anti-Bellism, publishes it in full—is that abominable inuendo in the form of a New York letter, indirectly accusing two United States Judges, Lowell and Gray, of being biased in their legal opinions by the fact that relatives of their families are, or were, owners of Bell stock at the time when they sat upon the bench in Bell suits. The public would probably be greatly amused were the facts to come out which are prompting these numerous attacks—attacks only equaled for downright unfairness and high color by those mysterious political statements which spring up like a jack in the box just before election, too late for refutation, in the hope of carrying through a fraud.

There are large holdings of many kinds of telephone stocks scattered throughout the United States, which will soon be worth face-value—for actual investment—in that peculiar currency the gray-headed citizen remembers to have seen when he was paddling around nights with a gun or a sword, "seeking whom he might kill somebody," during the late "onpleasantness."

The paper was dull, the vignettes looked like "escapes" from Libby, the printing was nothing to brag of. There was a clause which made the money a sort of heathen—it didn't know that its Redeemer liveth, but it was as good then, and is to-day, as tons of telephone stocks all over the country—as an investment, understand.

There comes to every man who lives long enough on this earth, a period of life when he is liable to be bidden to a feast or a frolic, where the bidding is known and understood to be complimentary. Coeval with that age there comes a struggle between duty and inclination, the one tugging toward acceptance, the other advising respectful declination. Since the first instant these mental wrangles have been going on in the brain of the writer, all on account of the Third Annual Ball of the employees of the M. & K. Telephone Company at Kansas City, on the 16th instant.

Now, forty years ago, or so, the light fantastic had some fascinations for the writer, but under the circumstances, thanks, regrets and best wishes must satisfy Bro. Macquarrie and the ladies and gentlemen who will on that sad and solemn occasion

> "Swing their partners through the hall,
> To the leader's ringing call,
> Or march in laughing, wild array,
> To the supper room away.
> Joyous may your bounding spirits flow
> From that glad hour when Gallagher says 'go!'"

Complimentary ticket number 2201 second series, is cancelled, and laid away as a memento.

A gigantic cable scheme is just cropping out, which, when accomplished, will connect Canada, England, New Zealand and Australia, telegraphically, making a stretch of 15,000 miles. The proposed route is from the terminus of the Canadian Pacific—the new city of Vancouver—to Barclay Sound, on Vancouver Island to the Sandwich, the Fanning and the Fiji Islands, thence to New Zealand, and either Brisbane or Sydney in Australia. In Canada the line would follow the Pacific road to Gaspe, Quebec, and thence through the straits of Belle Isle to the United Kingdom. The directory of the proposed combination of lines is headed by the Prince of Wales as honorary President, Sir Geo. Stephen, President of the Canadian Pacific Railway and Telegraph Co., President, with Sir Donald A. Smith and Hon. Peter Mitchell, Montreal ; Sanford Fleming and Sir John A. Macdonald, Ottawa ; Jay Gould, James Gordon Bennett, and Erastus Wyman, New York ; and representatives from New Zealand, Australia and England, to be named hereafter.

The Christmas holidays are bringing about the usual amount of changes and additions in electric light plants. One of these, in an establishment which has a grand opening on the 1st of December each year, with some sort of monkey show for the benefit of the little people and their mammas. This season, in addition to the usual Santa Claus with his requisition book, in which record is made of the wishes of the little people, the chimney corner and all that—demanded of the electricians a Christmas tree in which the lights would play a sort of fire fly dance. This was accomplished by the use of a tiny commutator and eight incandescent circuits in which groups of six lamps light up successively. The effect is very pretty and attractive.

The work was done by Messrs. Cole & Hulscher, who have just opened out as contracting Electrical Engineers, at 154 Lake street. Both parties are gentlemen of experience in arc and incandescent work, and the firm is both deserving and receiving a liberal share of patronage.

Callers during the week were Mr. Norman McCarty, agent for the Little-McDonald Cut out, and Col. Beetle, of the Western Electric, who has become a sort of Colossus of Rhodes, with one foot in New York and the other in Chicago, since the assumption of his present position.

Chicago, Dec. 6, 1886.

BOSTON ELECTRICAL NEWS.

It is now nearly a year since Treasurer Greenough, of the Boston Gas Company, read a paper before a meeting of gas engineers, advising gas companies in small cities and towns to enter upon the work of supplying arc lights to their customers. His argument was that if local electric light companies made any profit, a gas company could earn a large dividend on the cost of an equivalent arc plant. No company could compete with the gas company in furnishing arc lights. With land and often buildings at hand, cheap fuel at the doors of the furnaces, with men enough to manage engines and dynamos, and skilled officers whose burdens would be less increased by the management of an auxiliary electric light plant than by competition with an outside company, all profit possible in electric lighting could be realized. A movement was made last spring to secure the passage of a general law to allow gas companies to distribute electricity for light and power. There not being a hearty support by certain companies, this project was dropped. A large number, however, on their own account, petitioned the legislature for an amendment to their charters, to enable them to supply electric light and power. Right in the city of Boston, in the Charlestown district, the Charlestown Gas Company are operating a large Brush plant. The request of the Boston Gas Company now shows its purpose of entering the field in competition with other companies. There seems to be little doubt that next year there will be passed, by the Massachusetts Legislature, a general law allowing gas companies to go into the business of electric lighting and electric power distribution.

The organization of the Boston Electrical Company, formed by the consolidation of the Brush and Merchants Electrical Light Companies, has been completed under the laws of the State of Maine, with F. A. Gilbert, President, and S. S. Sias, Secretary, $1,000,000 capital. The outlook for the new company is extremely bright, the more economical use of the conductors of the two companies, whose circuits now in many cases overlap, will allow of a considerable increase of business without great outlay for construction. Besides the natural increase of arc lights, the new company will push the introduction of multiple series incandescent, for which purpose, at the Brush or Ferdinand street station, a 250 horse-power engine has been installed. It would not be strange if, in the course of a year, the incandescent business became of more importance than the arc. There is more than a possibility that the company may adopt some system of secondary distribution by transformers.

The question is often asked if there is enough talent in Boston and vicinity for an electrical society. Many electrical enterprises have their center in New England, particularly in and around Boston. It is to be hoped that some willing and enthusiastic persons may be found to make a beginning.

The Jarvis Engineering Company have received an order from the North Adams Electric Light Company for an additional 60 horse-power Armington & Sims engine.

In a town in Darkland, the offices of the Domicile Electric Light (parent) Company were lighted by one of their dynamos driven by a Pollux Castor engine. An agent for the Mazeppa high-speed engine entering one day, and noticing the fluctuating lights said to the president of the Domicile Company, "Those lights are a good advertisement for the Mazeppa engine"—curtain falls.

Dr. Amory, president of the Brookline Gas Light Company, was called on by a representative of the REVIEW recently, when he kindly consented to furnish some interesting data concerning the organization of the Suburban Electric Light and Power Company of Brookline, Mass. Some two years ago an electric light company was started in Brookline. Last spring, in anticipation of a demand for arc lighting in streets and stores, there was a movement to form an electric light company in Brighton. The citizens of Brighton, Allston and vicinity are now strongly in favor of electric lighting for their streets. The Suburban Electric Light and Power Company was formed, composed of gentlemen interested in the Brookline Gas Light Company, and they have applied to the city of Boston for permission to place poles in Brighton and also in Allston, where the pipes of the Gas Company already have been placed. The locations have been granted, and 770 poles will be placed in the near future. Of this number 220 are for trunk lines to carry the wires into Brighton, the remainder for use on side streets, so that if the city of Boston grant the petition of the inhabitants of Brighton and Allston for electric lights, the Electric Company will be in a position to supply the demand. Two 45-light Fuller-Wood dynamos and 50 lamps have been purchased of Sowdon, Elder & Wright.

To place the Gas Company and the Electric Company, under one management, the Brookline Gas Light Company has petitioned the Legislature for permission to furnish electric light and power. If this petition be granted, the management of the Electric Company will be transferred to the Gas Company ; if not, the companies will continue separate as at present. The question of Gas Company going into the business of supplying electric light and power is an experiment. They certainly cannot distribute electric current as it has been often done at low prices simply to aid the advancement of parent company. The gentlemen interested in this undertaking wished to take away grounds for talk that the Gas Company are obstructionists. They can surely compete electric light companies ; for they have on hand coke and tar which they make in excess of the demand, either of their own works or of outside consumption. It is well known that much of the tar made by the Gas Company is destroyed, since it is so difficult to market it. In England, also, it is a drug on the market, selling for a fraction of a cent a gallon. This tar makes a cheap fuel for steam boilers. The Suburban Electric Light and Power Company intend to furnish just such light as the public demands, either arc or incandescent lamps of varying sizes. There are about 50 miles of mains belonging to the Brookline Gas Company which cost about 50c. per foot to lay. Often a request is received from the city of Boston to light a street on which there is not a single building. Now it is far cheaper to run an arc wire through such a street than to lay a gas main and wait some years before any return is received for house owners.

Boston, Dec. 6, 1886.

—— The Allegheny Electric Light Company has closed a five years' contract to light the public buildings of Pittsburgh, after much squabbling among the Councilmen.

—— It is stated that the carbon manufacturers met in convention at Cleveland, Ohio, a few days since, and adopted the following scale of prices: for $\frac{7}{16}$-inch carbon, $12.00 per 1,000, and for $\frac{1}{2}$-inch, $15.00 per 1,000; 5 per cent. on one hundred thousand lots and 10 per cent. on orders of a million and over.

—— The Electric Light and Power Company, of Appleton, Wis., closed a contract last week with the American Electric Manufacturing Company, of New York, for dynamos and lamps with capacity of 75 lights.

—— The Westinghouse Electric Company, Pittsburgh, has purchased the entire property lately occupied by the Union Switch and Signal Company, and is installing a large plant of new tools. The testing room is doubtless the largest in the business, power for which is furnished by two Westinghouse engines of 200 horse-power each, so coupled that a large number of dynamos may be tested at once and for a long run.

Incandescent Lighting on Arc Circuits.

BOSTON, Dec. 4, 1886.

Editors Electrical Review :

In reply to the article entitled "Incandescent Lighting on Arc Circuits" in the REVIEW of Dec. 4, I would beg to call Mr. Herman Lemp's attention to the statement made by him that my so-called ideal system had been in practical operation in the Schuyler stations, and that the same could be run without substituting resistances. Having such a system he could not have impressed his mind fully with its value, or he has forgotten like the man who said he knew what electricity was, but it unfortunately had slipped his memory. Otherwise why should he not long before this have given those seekers for this class of information the benefits of his discoveries in this line, which has been so widely sought for and so much desired by the practical electric light men of the day, as certainly his system of requiring no substituting resistances cannot but be of inestimable value to any of the arc light companies. He says that the Edison Company has also made a similar attempt to light stores with incandescent lamps in series. I would ask if this is an attempt or an established fact, having only seen such an attempt in street lighting at Portland and Lawrence. Yours truly,

FRANK RIDLON.

Telephonic News

*** Manager Watson has gathered in 186 subscribers to his exchange in Mobile, Montgomery follows with 175, and Atlanta, under the able management of that telephonic expert Gentry, scores 927, and still holds the medal.

*** The Board of Supervisors, of Rochester, N. Y., met Nov. 29th, and resolved to discontinue the use of their telephones, and directed the Bell Company to remove its poles and wires from the county property. They will repent of their rashness.

*** The demand for telephones in Indianapolis are numerous, and there has been applications to the council for permits to string wires for private lines from the main telephone lines, as the telephone company claims it has no right to stretch new wires. The council granted a few permits, but the aldermen refused to concur A meeting is to be held Dec. 4th to settle the difficulty.

*** The Department of Justice has not yet decided what course to pursue in the telephone cases. It will take no action until the decree of the court throwing out the case of the United States for want of jurisdiction is filed. A decision to that effect has been rendered, as is well known, but the decree cannot be filed until the court meets again, which will be on the 9th of next month.

*** Papers were drawn at Rochester, N. Y., December 1st, having in view the incorporation of the Rochester Mutual Telegraph and Telephone Co., with a capital of $50,000, in 1,000 shares. Subscribers to the Central Company will be allowed one share for every telephone he has. Action will be taken at once to secure incorporation, and the work of the company will be confined to Rochester and vicinity. Beware, little lambs.

*** That the telephone can serve well for fire alarm purposes is illustrated by the following incident. Not very long ago an alarm came into the Worcester (Mass.) telephone exchange from one of the large factories there. The operator, looking at the guide, found out what floor it came from, and immediately rang up the watchman, who extinguished the fire without any one outside of the operator and watchman knowing anything about it.

*** George W. Cothron and others have entered suit against Frederick H. Brown (the Texas gas bag) to prevent the latter from disposing of a patent on telephonic improvements, and that he be required to carry out an agreement entered into with plaintiffs. The plaintiffs allege that they purchased from the defendant an interest in the patent, and that he afterwards refused to co-operate with them in the formation of a corporation, as agreed to.

*** The annunciator wire manufactured by the Detroit Electrical Works is a superior article, indeed; and, judging from the sample received at this office, will be in great demand in electrical circles. The diameter of the wire received is small and uniform; the surface is polished and finished hard, so that its lasting qualities are assured. A new branch of this company's business, which has been worked up by that bright young electrician, Mr. F. E. Fisher, manager, is that of fine magnet wire, and its excellence has resulted in extensive sales.

*** An exhibition of telephony is to be held in Brussels at the beginning of next year, under the auspices of the Société Belge des Ingénieurs et des Industries. The exhibition will be international, and will include all the apparatus and processes hitherto devised for the transmission of the voice to a distance. In addition to apparatus, plans models and diagrams will be received. No charge will be made for space during the five weeks the exhibition will remain open. Applications must be sent in before December 1st to the secretary of the society abovenamed.

*** The Windsor branch of the Canadian Bell Telephone Company has heretofore charged from $25 to $50 annually for the use of instruments, the latter sum being the price to concerns whose principal offices are in Detroit. About ten days ago a notice was given that in addition to the existing tariff ten cents would be charged for every message transmitted to Detroit. As this would mean an additional cost of from $300 to $400 to some subscribers, and as a telephone in Windsor without the Detroit connection is of about as much use as a plug hat to a Patagonian, a howl at once went up that was long and loud. It was then proposed to advance rates to $35 and $45, and keep the central office open all night. The patrons of the company, however, refuse to accept this advance. A meeting was held on Tuesday at the Merchants' Bank, at which thirty-five of the seventy-five subscribers in the town were present, and a resolution was adopted declaring the proposed advance an imposition, and pledging those present not to submit to it. Nearly every telephone in Windsor, it is claimed, will be ordered out if it is insisted upon.

*** The following table of statistics shows the state of telephony in some European countries up to September 30, 1886. It is a very poor showing compared with the state of the art in this country:

Countries.	Exchanges.	Subscribers.	Largest Exchange.	No. of Subscribers in Largest Exchange.
Germany	91	14,733	Berlin	4,348
Austria	11	3,032	Vienna	946
Belgium	7	3,305	Antwerp	1,020
Denmark	2	1,370	Copenhagen	1,336
Spain	3	594	Barcelona	360
France	50	7,175	Paris	4,054
Great Britain	89	15,111	London	4,193
Italy	16	2,456	Milan	1,064
Holland	6	2,469	Amsterdam	1,105
Portugal	2	350		
Russia	20	5,280	St. Petersburg	1,100
Sweden	15	5,705	Stockholm	3,825
Switzerland	88	4,900	Geneva	1,066
Total	380	72 457		

*** A Washington dispatch in the New York *Sun* of November 26 says: "Whatever the courts may do, and whatever the ultimate decision of the United States Supreme Court may be, if one is ever reached, Bell's telephone patent will have expired, and the Bell Company will have reaped the full benefit of the patent before a final decision of the Court can be had." Such was the sweeping statement which ex-Senator Joseph E. McDonald, of Indiana, made to-day with regard to the uselessness of the suit brought by the Government to break down Bell's patent. Mr. McDonald, as is well known, is one of the counsel for the defense of the Bell Company in the suit brought by the Government. He added: "Even if the United States Circuit Court at Columbus, Ohio, had assumed immediate jurisdiction, instead of deciding the other day that it had no jurisdiction, which is equivalent to deciding that the Bell Company can only be sued in Massachusetts, it being a local company carrying on business only in that State, it would still have been true that a final judgment in the case could not be obtained until after the patent will have expired In six years the patent will die, and the invention of the telephone will be public property. Now, supposing some United States District Court in Massachusetts, or in any other State, if you can suppose such a thing after the decision at Columbus, assumed jurisdiction and began the trial right away, it could not by any possibility conclude the trial and render judgment within two years. It would require more than two years to take the testimony. Then, if an appeal should be made to the Supreme Court of the United States, this case would not come up for trial in that Court for at least three years after the appeal was entered. There is a class of Government cases which have right of way, and may, with the consent of the Court, be called up and disposed of before its regular order on the docket But this case does not belong to the privileged class. It could not be brought up to the Supreme Court sooner than three years after appeal, and the trial in the Supreme Court would occupy at least as much time as in the Circuit Court. So you see that, with the very utmost expedition, it would require at least seven years to reach a final judgment by the United States Supreme Court—two years for trial in the Circuit Court, three years waiting on the Supreme Court docket, and two years for trial in the Supreme Court. So that the Bell Company stands a good chance of enjoying the full benefit of its patents, and the benefits it is reaping now cannot be taken away from it in the future, for if the prosecution were to be continued and a judgment ultimately obtained the judgment could not be retroactive."

Undulatory Theories.

Editor Electrical Review:

The theories of Mr. Bell have been so broadly sustained by the courts that they have come to be regarded by many as incontrovertible. I, however, venture to disagree with Mr. Bell's theories, nor am I alone in my conclusion that these theories are wrong.

I say this because I do not wish to be understood as desiring to pose as the apostle of a new theory, for I am nothing of the kind.

The theories I allude to, and will endeavor to discuss as briefly as possible, are set forth in the celebrated fifth claim of Mr. Bell's patent, No. 174,465, granted in 1876, in the following words: "* * * * *electrical undulations, similar in form to the vibrations of the air accompanying the said vocal or other sounds.*"

There is no doubt that the disturbance produced in the air by a sound is of a wave or undulatory character. The sound is transmitted by waves or vibrations in the conducting body, which, as a whole, does not move. My words, as I speak, do not carry the air with them to you; the air is in precisely the same place—every particle of it—as before. So that the very first point wherein Mr. Bell's so-called "electrical undulations" should resemble atmospheric undulations is entirely wanting. Electricity, as used by Mr Bell in his magneto telephone, goes from point to point; it travels. Did it undulate, it would need to have a permanent entity—to be like a log, which, scratched at one end with a pin, has its molecules so disturbed that the scratching can be heard by an ear applied to the other end. But the log, as a whole, does not move. Electricity, to be undulatory, must be capable of compression and rarefaction. We have heard of compressed air, etc.; but who ever heard of compressed electricity?

In Mr. Bell's telephone, as portrayed in Fig. 7, of 1876 patent, currents of electricity are produced, which, generated at *A*, proceed to *B* and cause the armature of *B* to vibrate precisely as the armature of *A* was vibrated by the sound waves.

Wherein then—when sound is used as the excitant—is it possible that there be any similarity between electric and atmospheric action? The first consists beyond question (I allude to Mr. Bell's case) of currents, and the latter it is equally or even more certain does not.

Had Mr. Bell claimed the reproduction of sound waves, similar to the sound waves or vibrations caused by the said vocal or other sounds, he would have been nearer the facts. This he does.

In a magneto telephone—the instrument upon which Mr. Bell has built and maintained his monopoly—electrical currents are produced succeeding each other with extreme rapidity, say from 16 in a second up to 25,000 in a second—about the limit of human hearing in fact, or one current of electricity for each sound wave, no matter whether it be complex or simple.

Take, for instance, the word "Brown." This word will cause the diaphragm of a Bell telephone to vibrate precisely seventy-two times; that is to say, the diaphragm will go towards the magnet thirty-six times and recede from it thirty-six times. The vibrations caused by this word are of two kinds—long and short. They follow each other alternately.

The undulatory character, or rather the curves, do not represent the actual motion of the diaphragm; they were caused by the motion of the paper on which these vibrations were graphically reproduced. The motion of the diaphragm was directly vertical as to its plane. There is about as much undulation as there is in the edge of a sharp saw.

Now it is an established fact that there is no current while the diaphragm is in motion. Currents are produced only when the diaphragm stops and starts. This being the case, there is plainly no continuity to the currents produced in a Bell telephone. The word undulation implies continuity. The waves caused in water by a stone can be seen and illustrated. The undulations in the air caused by a sound are of the same wave character.

Here we have continuity, the elevations representing compression, and the depressions representing rarefaction; each of these compressions impels the diaphragm towards the magnet, while each rarefaction allows it to recede.

A simple tone would produce regular vibrations. The human voice produces irregular vibrations. Pitch is determined by their frequency. Therefore as the current which was produced by the first vibration at *A* would cause the diaphragm of a telephone at the farther end of the line at *B* to vibrate precisely as the diaphragm at *A* did, so the current which was produced by the second or weaker vibration at *A* would cause a like weaker vibration at *B*. The reason is apparent—the shorter distance reached by the diaphragm in the second case produced a current of less strength. Thus we see that the undulations of the air caused vibrations; the vibrations caused intermittent currents of varying strength; these again caused vibrations, and the vibrations reproduced undulations.

The diaphragm of a Bell telephone is placed so close to the magnet that it is attracted toward it. The diaphragm dips in the center. For this reason it does not matter in which direction the coil surrounding the magnet is wound. If favorable to the development of magnetism of the same polarity, each succeeding current will cause the diaphragm to be attracted more or less, in accordance with the amount of increased magnetism produced. If the winding of the coil is in the other direction, the succeeding currents will proportionately decrease the magnetism, and release the diaphragm accordingly. The effect of the vibrations of the diaphragm in producing undulations of the air is precisely the same in either case.

I have used the word diaphragm instead of armature in this paper, because a diaphragm is used in the Bell telephone.

N. Y., Dec. 1, 1886. BEALE.

. . . A contract has been signed between the Lehigh Valley Railroad and the Phelps Induction Telegraph Company for the application of the Phelps system of railway telegraph to the entire system of road operated by them. The work of equipment has already begun, and the first section of about 100 miles, from Perth Junction to Mauch Chunk, will be in operation soon. The wires will be worked duplex, being used as ordinary Morse wires for local telegraph business and for train service simultaneously. The wire used will be copper with okonite insulation.

Improved Burglar Alarm with Eight-Day Clock.

The clock, illustrated on this page, is furnished with automatic cut-out, operating at any desired hour; servants' call bell attachment, to ring either by clock or hand; battery test, continuous ringer and silent indicator attachments, and sectional cut-out switches—all enclosed in handsome cabinet case, with lock and key.

A novel and valuable feature of the apparatus is the manner in which the various working parts are arranged. The clock movement, annunciator parts and all switches are fastened on hinged panels that swing outward, exposing the same to view and where they are readily accessible, so doing away with any necessity for removing the case from the wall—an operation that in many other makes of annunciators costs time, labor and annoyance.

These instruments are made of the best material and in the very best manner, and fully maintain the standard of excellence for which the Western Electric Company is noted.

Thermo-Batteries.

In the minutes of proceedings of the Institute of Civil Engineers, issued July, 1886, there is an abstract of a paper by Wilhelm Penkert, on the "Transformation of Heat into Electrical Energy, and the cost of the latter in the case of Galvanic and Thermo-Batteries and Dynamo Machines," in which the following table is given as to the cost of 500 watts per hour, by the several methods mentioned:

	Shillings.
Daniel's element.....	1.06
Bunsen element.....	1.51
Thermo-Batteries:	
Rebeick's star form.....	5.65
Rebeick's straight form.....	7.17
Clamond's, heated by gas....	16.03
Clamond's, heated by coal.....	0.42
Dynamo driven by steam.....	0.10
Dynamo driven by gas.....	0.25

From this it appears that Clamond's thermo-battery heated by coal is a very efficient and cheap source of electrical energy; and if it can be made cheaply, I should think it would make a good substitute for the dynamo and gas engine for charging accumulators used in household electric lighting, and the current might also be used direct to drive motors.

Waterbury to Have Standard Electric Time—The New Concern Just Organizing.

Warner's electric time system, which is growing into use, and has given general satisfaction in Ansonia, Derby and Birmingham, Conn., has been introduced through the medium of the Electric Time Company, whose present officers are John W. Hill, president, and George P. Chapman, secretary and manager. It is the intention of the company to give Waterbury a system of standard time at once reliable, which will do away with the winding and regulating of clocks, and the irregularity of the steam whistle and gong, the latitude of which now extends over a period better described in minutes than seconds. The company are to have direct telegraphic communication with the Yale observatory to effect these results The clocks in use by the company, and to be furnished patrons, are of different styles and sizes and are calculated to adapt themselves to varied uses. The one which is to be in common use is an ordinary square clock with a flat face and a metallic frame, which is suitable for offices of manufacturing concerns and public buildings, and is similar to the one so long in use at the Ansonia station of the Naugatuck Railroad. Then there is the night clock with a ground glass dial, behind which are two tiny incandescent lights, that glare at the touch of a button, the ground glass window dials—which are so extensively used by jewelers, and the self-winding clock, which is governed from the office but shall be independent of all the rest, insomuch as should a wire break the clock continues to go as if nothing had happened, winding itself every hour. The Electric Time Company also have a method of synchronizing ordinary regulators so that they will run on the same time, beating in unison with the master regulator at the office, which is an ingenious piece of mechanism. It bears the imprint of E. Howard & Co., Boston, is enclosed n a very tasteful cherry frame, has a 12-inch dial, improved mercurial pendulum, and is entirely automatic in its action, winding itself every hour by Pond's patent motor. Underneath the huge regulator at the main office is a group of small electric clocks, in the center of which is a small electric indicator by which the strength of the batteries can be determined at any minute. The company's wire system will not cover much territory, as there is to be but one circuit. The wire for outside uses will be hard drawn, of copper, and with double braided cotton covering, saturated with white lead.

IMPROVED BURGLAR ALARM AND EIGHT-DAY CLOCK OF THE WESTERN ELECTRIC CO.

The Effect of Stress and Strain on the Electrical Resistance of Hard Carbon.

On this subject Mr. Herbert Tomlinson communicates the following note to the November number of the *Phil. Mag.*:—"Prof. T. C. Mendenhall has published in the September number of *Silliman's American Journal* an account of some experiments on the effect of pressure on the electrical resistance of carbon. These experiments deal not only with such comparatively hard rods of carbon as are used in the arc lamp, but also with the compressed lampblack seen in Edison's disks. I will first refer to the experiments on the hard carbon. Prof. Mendenhall seems to think that these are in accordance with some experiments made by myself; but this I rather doubt, for the change of resistance produced by pressure on the carbon rod used by him would appear to be considerably greater than any which was obtained by myself on carbon rods of a similar kind. Had I not employed a very sensitive arrangement for testing small changes of electrical resistance, one which in fact enabled me not only to detect but to measure a change of resistance of about 1 in 100,000, I might have failed in detecting any change whatever. The result arrived at by myself was that a pressure of 1 grm. per square centim. would produce a percentage decrease of only .00000064. So that, if we assume the decrease of resistance to be proportional to the pressure, there would be required a pressure of 22,215 lbs. on the square inch to produce a decrease of resistance of 1 per cent. There is reason to believe that the pressure which would suffice to crush carbon is somewhere about 5,000 lbs. per square inch. If this result be at all correct, it would follow that pressure on the point of crushing the carbon would diminish the electrical resistance by less than ¼ per cent. Prof. Mendenhall does not give any data by which the amount of change of resistance observed by him can be calculated; but, if one may judge from the tenor of his remarks and his arrangement for experimenting, it would seem probable that the ratio of change of resistance to pressure was considerably greater in his experiments than in mine. Further, Prof. Mendenhall seems to credit me with doing what I have not done; for, after describing his own experiments on the effect of pressure exerted in the same direction as the current, he goes on to say, 'It was also found that compression at right angles to the direction of the current produced a similar effect, but less in magnitude. These facts had been already announced by Mr. Tomlinson.' I have made no experiments on the effect of compression at right angles to the direction of the current, but I think it probable that if I had I should have found increase of resistance, and not decrease, to follow on compression exerted in the above direction. On the whole, then, I am of opinion that my experiments are more in accordance with those of Professors Sylvanus Thompson, W. F. Barrett, and others, than with those of Prof. Mendenhall."

Mr. Tomlinson continues the above cited note as follows:

"As regards soft carbon, such as is used with Edison's disks, I cannot speak from experience. I was, however, much interested in reading the account given by Prof. Mendenhall of his investigations on the subject, and especially with that part of the account which relates to the influence of time on the change of resistance of the carbon disk when the pressure is varied; inasmuch as some of my own experiments have shown a similar influence of time on the electrical resistance of the viscous metals zinc and tin in the form of foil, when traction was applied in a direction transverse to that of the current. At the same time I would venture to suggest to Prof. Mendenhall that his ingenious experiments may not be quite conclusive as to a considerable change taking place in the specific resistance of the carbon. After showing that very considerable change does take place somewhere in the circuit of the mercury in contact with the carbon button and the button itself, he substitutes for the soft carbon a disk of hard carbon similar in dimensions, and finds that a pressure of only 7 centimeters of mercury lowers the resistance by nearly 3 per cent.; and he says, 'There can be little doubt that this small reduction is due almost entirely to better surface contact produced by pressure.' From the above it is evident that the surface contact between the mercury and hard carbon was by no means good; but, writes Prof. Mendenhall, 'The faces of a soft carbon disc are always smooth and polished; the surface of hard carbon, on the contrary, is generally more or less rough and irregular. It would appear, therefore, that if the reduction of the resistance of soft carbon by increase of pressure is due to better surface contact, this reduction of resistance should be much more marked with hard than with soft carbon.' The above assumption is a very dangerous one to make, for the surface of the soft carbon might not be in the same state of cleanliness as that of the hard carbon. But even suppose we allow that there was better contact with the mercury in the case of the soft carbon than in that of the hard carbon, it does not necessarily follow that the observed decrease of resistance consequent on increase of pressure occurred in the carbon of the button. The buttons are, I believe, formed by compressing lampblack mixed with gum water. Must we not suppose, then, that the particles of lampblack are bound to each other by the gum, and separated from each other by the gum, to a greater or less extent? Would not the diminution of resistance experienced in the body of the button when pressure was applied be due to one or both of the two following causes: (1) Diminution of the resistance of the thin coating of gum between the particles of carbon; (2) Better surface contact between one particle of carbon and another? The influence of time on the change of resistance might be quite accounted for by supposing cause (1) to be at work."

TELEGRAPHIC

.... Germany has 23,000 miles of underground telegraph wires, and France 7,200, all in successful operation.

.... The first practical electric telegraph was worked between Euston Station and Camden Town on July 25, 1837.

.... The Baltimore and Ohio Telegraph Company will make a strong bid for the exclusive control of telegraphic privileges on the grounds of the League and American Association. The Western Union has heretofore had the privilege, and will try to renew their contracts.

.... A good joke is told at the expense of a telegraph operator. He visited the Catskills last summer in company with a friend, who, knowing his occupation, set an alarm clock to ring at 3 o'clock in the morning. At the first tap of the bell the operator sprang from the bed and went fumbling around the room in vain efforts to find the switchboard, and finally stumbling against a chair woke up.

.... A new enterprise has just been organized in this city for the construction of a direct cable to Venezuela and Brazil, which is called the Pedro Segundo American Telegraph and Cable Company, and starts out with a capital of $2,500,000. The Imperial Government of Brazil and Republic of Venezuela have granted very favorable concessions to the new company. Its cable will be over 4,000 miles long, and is being constructed in England.

.... The United States Circuit Court decided on November 28th a case against the Western Union Telegraph Company of interest to the public. A creditor at Memphis telegraphed to his lawyer as follows: "A B owes me $1,000. If grounds, attach." This dispatch was not delivered Subsequently a similar dispatch was sent by another creditor to the same lawyer. An attachment was laid and the money secured, but only enough to pay the second creditor. The first creditor sued the Western Union, and the court held the company liable for the debt. Judge Jackson, in delivering his opinion, said that the dispatch disclosed on the face of it its importance.

... An automatic apparatus for registering the movements of trains, used in Germany, is described in the *Master Mechanic* as follows: At both ends of tunnels, and at given distances along the track, say every quarter of a mile, a small wheel or button, resting on a spring, is placed at the side of the rail, projecting slightly above the upper surface, and yielding with an immediate rebound, as the wheels pass over it. By doing this, it connects a battery in a small metal structure close by with given stations. In the stations, so-called electric clocks are fitted with external wheels, which keep paper tape in constant motion, which, of course, corresponds exactly with that of the clock itself. The tape is divided into numbered spaces, representing hours, minutes and seconds, and a slender hammer, with an aniline tip, is connected with the clock and operated by electricity, making a short line of the tape at every pressure of the car wheels on the button described above. In this way, if a train enters a tunnel at 10 o'clock, the aniline-pointed hammer will record the pressure of the first wheel on the button at the figure 10 on the tape; the passage of each successive axle, and, therefore, the number of cars, is also recorded, and the length of time which ensues before the same thing is repeated at the next button indicates the speed the train is making. By a machine of this kind it would be possible to have the movement and stoppages of all trains registered at a central office.

ELECTRICAL AND SCIENTIFIC

* * The Colorado Telephone Company is building a line to connect Canon City with Pueblo and Denver.

* * An electric railway was put in operation at Scranton, Pa., last week successfully. The road is two miles long, and the car makes four trips an hour.

* * The construction of an electric street railway is now in progress in Selma, Ala. The tracks are being laid, and will be ready at an early day for the trial trip.

* * No record is kept of the yield in the United States in cubic feet of natural gas. The amount of coal displaced by gas in 1885 was 3,161,600 tons, valued at $4,854,200. In 1884 the coal displaced was valued at $1,460,000. The yield has increased tenfold since 1883.

* * The form which an electro-magnet should have depends upon the nature of the operations it is used to perform. A design of an electro-magnet which is very suitable for some purposes is not suited at all for others. Supposing it is desired to make an electro-magnet which shall be capable of rapid changes of strength, or possess small residual magnetism, it should be made of very soft Norway or Swedish iron, and have the form of a short, stout bar, rather than a long, thin one. The reason for this is that the ends or poles of a magnet exert a depolarizing action upon the mass of the interior of the magnet.

* * From the Leadville *Dispatch* we learn that a wild craze has struck that city over a new electric indicator that is used to determine the location, from surface observations, of underground mineral bodies. It is the invention of a prominent electrician of Boston, and is constructed upon the theory that the strong electric currents known to be induced by large mineral bodies can be utilized to locate the latter. The machine is a simple affair consisting of electrodes which connect with batteries in a box containing an electric needle. The influence of the electric subterranean currents upon the needle is supposed to indicate the strength of an ore body. For instance, ore that would swerve the needle is supposed to indicate the strength of an ore body.

* * Mr. H. Fontaine has been making investigations at the works of the Compagnie Electrique, in Paris, on the electrical transmission of energy. The experiments resembled those of M. Marcel Deprez in transmitting power from Creil to Paris, except that M. Fontaine substituted a resistance equal to 100 ohms for the line of 112 kilometers. The result arrived at was that 52 per cent. of the power applied to the generating dynamos was transmitted to the brake of the receiving machine. Though this result cannot be considered as altogether satisfactory, yet it is much better than some of those already obtained, and is encouraging. If even 50 per cent. of the power of our waterfalls could be made available at a distance of from 50 to 75 miles by electrical transmission, the advantage to many industries would be incalculable. And this would be especially true of mining in many districts where fuel is expensive.

* * A decision was not long ago rendered in the Chancery Division of the High Court of Justice, London, before Mr. Justice North, in the suit of Abraham Van Winkle, of Newark, N. J., U. S. A. *vs.* William Alexander Carlyle, of Birmingham, England. This was a suit for infringement of dynamo-electric machines for electro-plating, owned by the said Van Winkle, of the firm of Hansom, Van Winkle & Co., Newark, N. J., and has been some time pending in the English courts. An interim decree for injunction having previously been granted, ti has now been made absolute—the defendant being restrained during the continuance of the letters patent, or any extension thereof, from making or selling any magneto-electric machines under or in accordance with or in violation of the letters patent on which the suit was brought. The invention relates to the radial construction of the armature and the use of a governor to prevent reversal of the current.

The Bowsher Speed Indicator.

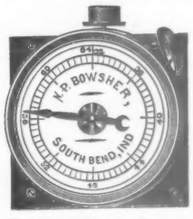
It is well known to users of electric light machinery that it is very important to know at all times the exact speed of their dynamos, and from experience we know that it is impossible to tell when machinery is running a "little too fast" or a "little too slow," by depending upon the sense of hearing alone. This is especially the case when the variation of speed is gradual, for the ear as gradually accommodates itself to the change. And where the speed is fluctuating or variable it is especially confusing and misleading.

With this indicator it is not necessary to hold a watch and count for a given length of time, nor is it necessary to resort to calculation to tell the speed. You simply look at the dial and the pointer or index shows the speed in figures.

The Bowsher speed or motion indicator will tell the tale whether it be applied to engine, water wheel, line shaft or dynamo.

From the foregoing any one running electrical machinery will at once recognize the practical application and utility of the Bowsher speed or motion indicator, in connection with dynamos, engines, water-wheels or line shafts.

The Indicator consists of a cylindrical case twelve inches in diameter and twelve inches



THE BOWSHER SPEED INDICATOR.

long, provided with a pointer and suitable dial (the figures on the dial being subject to change, always showing the speed of the shaft to which connected). The pointer is connected with a rack-bar and pinion to a properly constructed ball governor, the governor being located in the centre of the case, having suitable bearings at the top and bottom. This excludes all dust and dirt from the working parts. Of course, everyone will recognize that the different positions of the balls, and consequently those of the pointer, are governed by the "laws of centrifugal force," and are unalterable, and that the pointer must tell the truth at all times, viz.: that if the speed of the machinery to which the Indicator is connected is uniform, the pointer will remain stationary at a certain point, but if the speed decreases the pointer will move back on the dial, or if the speed increases it will move forward at the same ratio, always indicating the exact speed of the machinery in figures.

The alarm is arranged so that when the speed is "too fast" or "too slow," the hammer strikes a gong, and may be adjusted so as to give any amount of variation of the motion desired from a given speed before striking the alarm. It requires no care or attention, as it is always in readiness to alarm when there is a change in the motion, although the hammer may be "hooked back" so as not to alarm at any speed. The alarm is of great importance, as with it the man cannot neglect his machinery unless he does it purposely.

Springfield, O., has just closed a five-year contract with the Springfield Gas Light and Coke Company, by which the company agrees to furnish to the city and to all private consumers the best quality of gas at $1.50 per thousand feet and to light the streets at $20 per post per annum. They will have cause to regret this rash step before this contract is completed.

* * Two or three years ago the *Saturday Review* laid down the law of plagiarism in three clauses: (1) "In the first place, we would permit any great modern artist to recut and to set anew the literary gems of classic times and of the Middle Ages." (2) "Our second rule would be that all authors have an equal right to the stock situations which are the common store of humanity." (3) "Finally, we presume that an author has a right to borrow or buy an idea, if he frankly acknowledges the transaction." In commenting on this code I suggested that there might be a difficulty of interpretation in the first clause, for who is to declare any modern a great artist? In the second clause the law is clearly stated, and whether any given situation is or is not common property is a question of fact for the jury. The only difficulty in applying the third clause is in defining precisely the degree of frankness and fullness required in acknowledging the indebtedness. But hypercriticism is out of place in considering a suggestion as valuable, as needful just now, and as neatly put as this triple law of the contributor to the *Saturday Review*. A general acceptance of this code would tend to clear the air of the vague charges of plagiarism which hang in heavy clouds over the literary journals. Before we can decide whether an author is guilty of the offense we must be agreed on what constitutes the crime, what are its elements and what are the exemptions. I have ventured to draw up the statutes of exemptions in a form slightly different from that given in the *Saturday Review*, a little broader and stronger, and perhaps a little simpler: "A writer is at liberty to use the work of his predecessors as he will, provided always that (1) he does not take credit (even by implication) for what he has not invented, and (2) that he does not in any way infringe on the pecuniary rights of the original owner." When M. Victorien Sardou brought out the farcical comedy, "Les Pommes du Voisin," he was accused of having stolen it from a tale of Charles de Bernard, and he retorted instantly with evidence that he had the permission of the holders of the Bernard copyrights, who were to share in the profits of the play. Here M. Sardou was innocent under the second clause of my law, but guilty under the first, insomuch as he had concealed his indebtedness to Charles de Bernard and had taken credit for an invention which was not his own. When Mr. Charles Reade turned Mrs. Burnett's "That Lass o' Lowrie's" into a play called "Joan," without asking the permission of the American author, he was guilty under the second clause and innocent under the first, for there was no concealment of the source of the drama. With a proper understanding of what is and what is not plagiarism, there should go a greater circumspection in bringing the accusation. Plagiarism is the worst of literary crimes. It is theft, neither more nor less. All who desire to uphold the honor of literature, and to see petty larceny and highway robbery meet with their just punishment, are concerned that the charge shall not be idly brought or carelessly answered. But now so often has the amateur literary detective cried "Wolf," that patience is exhausted, and accusations of literary theft have been flung broadcast, until they may be met with a smile of contempt. This is not as it should be. It is contrary to public policy that the literary conscience should become callous. The charge of plagiarism is very serious, and it should not be lightly brought or lightly borne.

A Ghost at the Telephone.

A correspondent of the Boston *Post* heard a story not long ago of an undertaker who was called up in the night by a ring which the central office operator said was from one of the great cemeteries, and the voice that called was so strange that it made him shudder. It was wonderfully distinct, and yet so slow, so cold, so far away, that it sounded like nothing else that he had ever heard. It uttered not a single word except a long drawn out "Hel—lo! Hel—lo—o-o! Hel—l-o-o-o-o-o!" And the more he shouted back, the more that one ghostly call came over the wire to him. Dumfounded at last, he hung up the telephone and sat down, but meditated uneasily, while the sound still rang in his ears. Then he jumped up and rang the central office. "Give me No. —," he called out. That was the cemetery. Presently he had the connection. "Were you calling me just now?" "Certainly not. Haven't called to-night." Then he objurgted the central office. "Certainly the cemetery did ask for you," said the operator, "and I made the connections." Next night the same call came, and the shuddering undertaker heard the same ghastly "Hel—l-o o-o-o" until he could bear it no longer. Then the same colloquy with the cemetery office and the central operator followed. The undertaker grew almost insane with the ghost call, as he soon began to regard it, and had the telephone taken out of his shop, to the great detriment of his trade, so that he afterward had it replaced, and though he has not since been called up by the voice from the other world, he sits in nightly dread of it.

English Mechanic.

Prof. Lodge answers the following questions in the *Electrician* of recent date:

Are electrolytic and metallic conduction thoroughly distinct, so that no substance has a trace of both conductivities at once? In other words, has any electrolyte a trace of metallic conductivity? or can any compound metal experience a trace of electrolysis? Is electricity able to slip through or among ions, instead of necessarily propelling them, and is it able to do both things at once? A positive answer to this question need not be given in the form of a disobedience to Ohm's law, for there is no reason for supposing that a metallic slip of electricity through the ions would be more prominent with small than with great current intensity. Insufficient polarization E.M.F., and constant leakage of a current against it, are the facts which have caused many experimenters to suspect such metallic slip; but secondary actions would so easily account for the same thing that it is necessary to be extremely cautious in interpreting such obervations. Helmholtz's air-free cell proves that if any effect of the kind takes place, it must be excessively small for ordinary acid (Faraday lecture). Clerk's experiments show that no such explanation of the behavior of certain anomalous fused salts is necessary. But it is impossible to give a certain negative answer to the question, on experimental grounds, until every substance has been tried with minute quantitative accuracy. A positive answer for any substance would, of course, be a denial of the applicability of Faraday's law to that particular electrolyte.

To the second half of the question,

Can any metallic alloy conduct electrolytically? seems easier of attack. Experiments have been made, on tin and lead, potassium and sodium, sodium and mercury, gold and mercury, cast-iron, with negative results so far. But none of these alloys, except sodium and mercury, are well chosen. It would seem advisable to choose two metals far apart in the voltaic series, or in the thermo-electric series, so that one might cling more to positive electricity, and the other more to negative if possible. Or they might be chosen with their so-called "specific heats of electricity" very different. Or, again, it may be well to choose two metals differing considerably in conducting power, so that one might be rubbed along with the current, so to speak, more than the other. I might suggest gold and lead, or copper and tin, or copper and zinc, or bismuth and antimony; beside, of course, mercury and zinc, or mercury and sodium, or, again, copper and zinc dissolved in mercury, etc. But it is to be remembered, from the experiments of Dr. Guthrie, Prof. Chandler Roberts and others, that diffusion in all such cases is excessively rapid, and that precaution must be taken to diminish its effect in restoring uniformity of composition. A U tube with a constriction at its bend might be used, the whole filled with homogeneous alloy, and kept just above the fusing point. Pass a very strong current through the U, and gradually cool down until the whole is solid, keeping the current on all the time. Then analyze the two legs and see if they show any difference in composition.

Secondary Generators or Transformers.

The London *Electrical Review* publishes the following:

Messrs. Zipernowski and Déri's letter of October 30 shows clearly that they claim as a great and important discovery made by them—the simple connecting of secondary generators in parallel arc.

I am not at all concerned about what the specifications of these gentlemen contain; but I am certainly inclined to maintain my priority of invention, as far as parallel arc connection of secondary generators solves the problem of their practical application, and anyone reading the paragraph containing the allusion to my discovery of the fact that secondary generators are self-regulating when coupled in parallel arc, can see that the statement is very decided; and I can prove that it was a statement of facts ascertained by practically working secondary generators in parallel arc.

I had tried Gaulard and Gibbs's system experimentally, by connecting in series with constant current, and had failed to obtain regulation entirely. I then thought of and tried parallel arc connection, and perfectly succeeded in obtaining self-regulation. There certainly is not much visionary about that; the visions of a monopoly, I am afraid, are all on the other side, and my experiments and published results are likely to somewhat mar the beauty of monopoly visions.

I was not discouraged by the "prodigious" conductors required by such a system, but by the prodigious E.M.F. and conductors combined, and your readers can themselves judge of the "prodigiousness," if these gentlemen will only state approximately the section of main conductor required to light up, say, a district of London, and state the difference of potential between the mains, and remember I used the word three years ago.

Between the date of my first experiments with secondary generators in parallel arc and this date, I have been working at the subject continuously, and have a system which contains a far more important principle than the simple connection in parallel arc, and the last paragraph of Messrs. Zipernowski & Déri's letter shows clearly that the simple parallel arc connection is all that renders their system self-regulating.

I do not know anything about "rational methods of connection of transformer," I know only two methods of connecting to the mains—series and parallel—both of which methods it is open for anybody to apply to any form of transformer.

I am very much alive to the difficulties of such systems of distribution, and am impressed with the important improvements made by these two gentlemen in the dynamos and transformers employed by them; but I am surprised at such a claim as that of simple connection in parallel arc.

RANKIN KENNEDY, Electrician.

—— The Canton Schuyler Electric Light Company, Canton, Ohio, has been incorporated. Capital stock, $50,000. James H. McLain, and others, incorporators.

—— The Belvidere Gas and Electric Light Company, Belvidere, N. J., has been incorporated. Capital stock, $30,000. Edward M. Beesley, and others, incorporators.

—— The electric light plant of the American system installed at Hornellsville, N. Y., about a year ago, has given the most perfect satisfaction to the Hornellsville Company, and there has been a constant increase of business since the plant was first established. The company is now paying 1 per cent. per monthly dividends, which is highly satisfactory to its stockholders. Owing to the increased demand for lights and the fact that the Erie Railway Company have given them a large order for lights in their railroad works, the company has decided to make a large increase in its plant. Last week an order was given to the American Company for one hundred additional lights. This will make the American Illuminating Company, of Hornellsville, one of the largest plants in the State outside of New York and Brooklyn.

The Redding Plating Machine.

This machine is designed for the use of platers and others who do not need a large machine.

It has a large electro-magnet, wound with large copper wire, and with the poles (between which the armature revolves) down near the base. The armature is made of soft iron, and has an insulated copper ribbon, wound transversely around it.

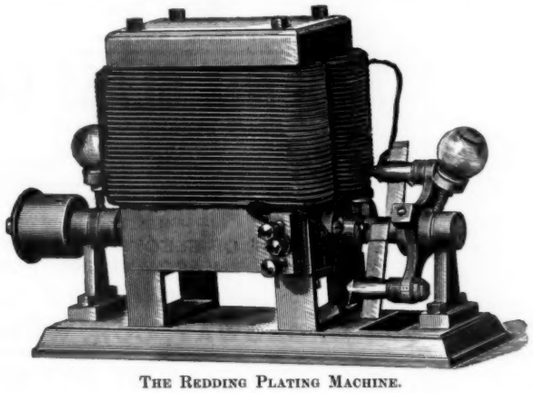
Upon one end of the armature is fastened the pulley for driving the machine; upon the other end is the commutator.

The brushes are both fastened to the same brush holder, which is perfectly adjustable and arranged so that the strength of the current can be instantly changed to suit the requirements of the work, and the brushes can be readily re set to make up for the wear.

The wire on the field magnets, and the ribbon on the armature are made of pure copper and very thoroughly insulated, being made to order especially for this machine.

The machine is very carefully made in every part, of the purest material to be obtained, made to order especially for the purpose, and all the parts are so perfectly fitted and adapted to each other, that it runs without heating, and gives a stronger current with the least consumption of power of any machine of its size in the market.

It is impossible for the machine to reverse as the field magnets are charged by a special current, which maintains a constant and intense field, entirely independent of the current which does the depositing.



THE REDDING PLATING MACHINE.

It also acts very promptly and gives a current of full strength for depositing the instant the connection is made, whether the amount of work in the solution be large or small.

This machine gives a current of 30 amperes, 600 volts. The Redding Electrical Company, of Boston, Mass., are the manufacturers.

The apathy among those interested in the erection of a line of elevated railroad in Boston is a subject of much comment. At no time has public sentiment been so favorable as at present for granting a charter. Boston was far behind other cities in the introduction of horse railroads, and it is to be presumed that we may have to wait some time for an elevated structure unless more push and energy is shown by its advocates. The legislature is, however, quite favorable to any system of electrical railroads. The Enos Company are having a controversy with their Sub. Co., the Winthrop Electric Railroad Company, and unless this is settled the road may not be built within the limit set by the legislature. The Sub. Co. has the charter to build the road, but refuses to do so unless large concessions of territorial rights in the Enos system are given to the Sub. Co.

Practical experience has shown that a greater amount of work is accomplished by sewing machines when run by electric motors than by foot-power. Not only can the work be done with a higher speed of the machine, but considerable time wasted in bringing the machine up to full speed by the use of foot-power is saved. Less repairs are required, for the irregularity of the foot motion is destructive to the adjustment of the more delicate parts of sewing machines.

—— The Jacksonville Electric Light Company is arranging to greatly increase its capacity. Last fall while in New York Messrs. J. R. Campbell and John G. Christopher purchased a new one hundred and fifty horse-power cut off Englis engine and a Babcock & Wilcox safety boiler to match, besides three new dynamos, one arc and two incandescents, for their works in this city. The machinery has all arrived and is now being put in at the works, which are to be greatly enlarged. The incandescent lights are of the very latest improvements, and can be turned on or off the same as gas, or can be burned very brilliantly or dimly as desired.

—— Some arc lamps are fitted with short-circuit switches only, and many are the unpleasant shocks lamp inspectors receive while trying to adjust a refractory lamp on a circuit in which the current is flowing. The Brush Electric Light Company, of Boston, are placing on their circuits cut-out switches. The contacts are so arranged that the lamp is short-circuited before the lamp circuit is broken, and in turning on the current connections are made with the lamp terminals before the short circuit is broken. By the use of this switch, lamps may be trimmed at any time. The action of the Brush Company in this particular is well worth imitation on the part of local electric light companies. The above-mentioned switch is made by W. S. Hill, 133 Oliver street, Boston, Mass., who has just completed a new arc lamp, which, for fewness of parts, simplicity and steadiness, is an advance in one of the most necessary adjuncts to a successful system of arc lighting.

—— The foundry of the Westinghouse Machine Company at Pittsburgh and the malleable iron works of McConway, Torley & Co., were destroyed by fire on the 14th. The latter firm will rebuild in another location, and the Westinghouse Machine Company have secured the entire block, on which they will erect a new foundry and other buildings. The works of this company now cover nearly three blocks of ground.

—— Mr. George Westinghouse has just purchased a piece of ground at the corner of Penn avenue and Ninth street, Pittsburgh, on which to erect an imposing office building. The property has a frontage of 80 feet on Penn avenue, and extends back along Ninth street 110 feet to Exchange alley. The price paid was $78,000, being almost $1,000 a foot. The new building will cost at least $200,000. It will be a magnificent structure, eight stories in height. Pressed brick, with terra cotta finish, is the material to be used. The building will contain all the offices of the Philadelphia Gas Company, and all Mr. Westinghouse's other offices, including the Westinghouse Air Brake Company, the Union Switch and Signal Company, the Westinghouse Machine Company, the Westinghouse Electric Light Company offices, Westinghouse, Church, Kerr & Company and the Safety Appliance Company. The edifice will be known as the "Westinghouse Building," and it is expected to be ready for occupation next July.

—— The City Hall clock of Hartford is illuminated by electricity.

ELECTRIC LIGHT NEWS

—— Electricity is now applied to the bleaching of cotton and linen fabrics.

—— The advent of the electric light for street use in Yonkers is hailed with enthusiasm. Many of the public streets are thus lighted.

—— The Jarvis Engineering Company, 61 Oliver street, Boston, have delivered the second Armington & Sims Company engine to the Waltham Electric Light Company.

—— The following certificates of incorporations were filed at the capitol last week: Plattsburgh Electric Company, capital, $12,000; Auburn Electric Clock Company, capital, $10,000.

—— The American Electric Manufacturing Company sold a 50-light plant last week to the large worsted mill of Messrs. S. Schofield, Son & Co., in East Manayunk, which is to be installed and in running order the early part of next week.

—— About 200 incandescent Edison lights are to be placed in the James Riddle, Son & Co.'s cotton mills, and two plants are to be placed on barges belonging to the Brandywine Granite Company at Wilmington, Del.

—— The house and engines of the Altoona, Pa., Electric Light Company are now in readiness for operations, and such is the pressure on the establishments manufacturing material for incandescent light that all companies desiring supplies are obliged to send in orders months in advance.

—— Joseph N. McLeod brought an action before Judge Courtney last week to recover from the Brooklyn Electric Construction Company $208 for services rendered from August 1, 1886, to October 13. The defendant failed to appear, and judgment for the full amount was rendered for the plaintiff.

—— The petition of the politicians and fast horse owners, including the president of the Electric Lighting Company, that Ocean Parkway and the Park drives of Brooklyn be lighted with electricity on moonless nights, was referred by the Park Commission to its superintendent and its executive committee for an early report. It might contribute to the comfort of drivers who linger long on the road to have the electric light as a guide homeward.

—— Articles of incorporation of a new electric light and motor company were today filed at the office of the Secretary of State. The object of the company, which is called the Clark Electric Company, is to manufacture and operate electrical apparatus and machinery. The capital stock is $3,000,000 in 30,000 shares. The original incorporators are James H. Seymour and Charles H. Applegate, of New York city, and Earnest P. Clark, of Owego, N. Y.

—— The Nashua Electric Light and Power Company, Nashua, has started its electric lights with perfect success. It is running forty-five Thomson-Houston Company's arc lights, and will soon start its incandescent lamps. The Armington & Sims Company engines are used, and the boiler is set with the Jarvis patent boiler setting. Their fuel is waste wood, wet sawdust, costing them 75 cents a night to run forty-five arc lights.

—— The Woonsocket Electric Light Company, Woonsocket, R. I., have received their new Armington & Sims engine to be used in making power for incandescent lights. This style of engine is so arranged that while one fly-wheel is used for running an arc light dynamo, the other of a larger diameter can be used to run incandescent lamps. In some electric light stations the Jarvis Engineering Company, who sell these engines, have arranged them so while one wheel is used for electric lighting the other is used to run a line of shafting in the loft above to run machinery.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING NOV. 30, 1886.

353,288 Electric telegraph relay; Joseph I. Conklin, Jr., Brooklyn, N. Y., assignor of one-half to the Lewis & Fowler Manufacturing Company, same place.

353,305 Regulator for electric arc lamps; Hugo Henneberg and Richard I. Lorenz, Vienna, Austria-Hungary.

353,310 Dynamo electric machine; Nathaniel S. Keith, San Francisco, Cal.

353,333 Incandescent electric lamp; Charles J. Van Depoele, Chicago, Ill.

353,334 Automatic circuit controller for electro-plating machines; Charles J. Van Depoele, Chicago, Ill.

353,345 Electric locomotive; Charles J. Van Depoele, Chicago, Ill.

353,337 Microphone; Thomas Wallace and Oscar A. En Holm, New York, N. Y.

353,346 Electric therapeutic instrument; Charles E. Baldwin, Philadelphia, Pa., assignor to Martin V. Wagner, Marshall, Mich.

353,349 Electric lighting of railway trains; Chas. E. Buell, New Haven, Ct.

353,350 Switching apparatus and test circuit for telephone exchanges; John J. Carty, Cambridge, assignor to the New England Telephone and Telegraph Company, Boston, Mass.

353,367 Governor for electric motors; Alexander W. Meston, St. Louis, Mo.

353,393 Railway signal; Thomas H. Williams, Bellevue Borough, and George M. Eitemiller and John S. Lucock, Allegheny City, Pa.

353,403 Electrical appliance for dental chairs Levi L. Deckard, Middletown, Pa.

353,414 Dynamo electric machine; Carl Coerper Cologne-on-the-Rhine, Prussia, assignor to the Helios Actiengesellschaft fur Elektrisches Licht und Telegraphenbau, Ehrenfeld and Cologne, Germany.

353,536 Telephone transmitter; William Burnley, North East, Pa., assignor of two-thirds to Charles A. Hitchcock, same place, and Lewis F. Watson, Warren, Pa.

353,541 Electric telegraph: Edward A. Cowper, Westminster, county of Middlesex, England, assignor to Brent Good, New York, N. Y.

353,592 Autographic telegraph; James H. Robertson, Rutherford, N. J.

353,593 Autographic telegraph; James H. Robertson, Rutherford, N. J.

353,594 Autographic telegraph; James H. Robertson, Rutherford, N. J.

353,598 Carbon for electrical purposes; Edgar Shaw, Lynn, Mass.

353,603 Electric circuit controller; William Stanley, Jr., Great Barrington, Mass.

353,637 Electrical apparatus for working valves; Henry Likly, Charles A. Carpenter and Fred. B. Graves, Rochester, N. Y.

353,643 Electric arc light; George C. Pyle, Cuyahoga Falls, Ohio, assignor to the American Electric Headlight Company, Indianapolis, Ind.

353,649 Electric current indicator; Montgomery Waddell, Cobourg, Ontario, Canada.

BUSINESS NOTICE.

"In making the statements which follow we can verify each and all of them as facts. Mr. Edward P. Thompson, of Temple Court (7 Beekman St.,) New York, is a good man to bring your patent cases to, for he is thoroughly versed in all the ins and outs of a Patent Attorney's duties. The following are some of his qualifications: Graduate of Stevens Institute as Mechanical Engineer. For four years tutor of classes of young men in mathematics and experimental physics at Elizabeth, N. J. Served professionally as Electrician and Chemist in the Brush-Swan Electric Co. of New York for two years. Because of past successes as a Patent Attorney at 13 Park Row, New York, was appointed, to succeed N. S. Keith, of the patent agency of the *Electrical World* and Associate Editor. N. S. Keith is known as the Translator and Reviser of Schellen's Treatise on "Dynamo Electric Machinery." Mr. Thompson for two years personally prepared and prosecuted all the patent business of *Electrical World*'s Patent Agency, and is the author of a series of articles in said paper upon "Analytical and Systematic Method of Inventing," which were widely known and favorably received. Mr. Thompson is a member of American Institute of Electrical Engineers and American Society of Mechanical Engineers. He is author of the "Expansion of Polynomials," which the ablest mathematicians of the world universally commend." —*New York Observer*.

NEW YORK & WASHINGTON ELECTRICAL PATENTS.

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A. C. FOWLER, C. E., Attorney at Law, EXAMINER IN U. S. PATENT OFFICE, 1880 to 1886, ELECTRICAL DIVISION. Office, Temple Court (Beekman and Nassau Streets), New York City.

CHAS. D. FOWLER, Counselor at Law. Office, Pacific Building (622-4 F Street, half block east Patent Office), Washington, D. C.

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Fig.259

Fig.255

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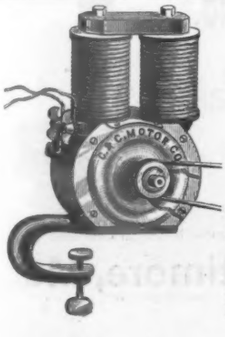
The Transmission of Speech by all known forms of ELECTRIC SPEAKING TELEPHONES infringes the right secured to this Company by the above patents, and renders each individual user of telephones, not furnished by it or its licensees, responsible for such unlawful use, and all the consequences thereof and liable to suit therefor.



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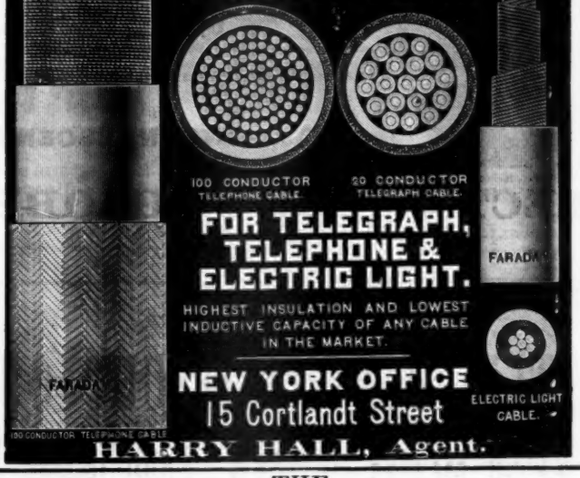

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The above Sale is adjourned to Monday, Dec. 29, at same time and place.

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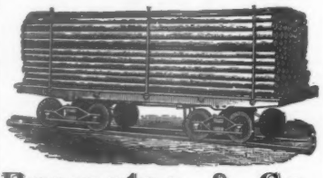

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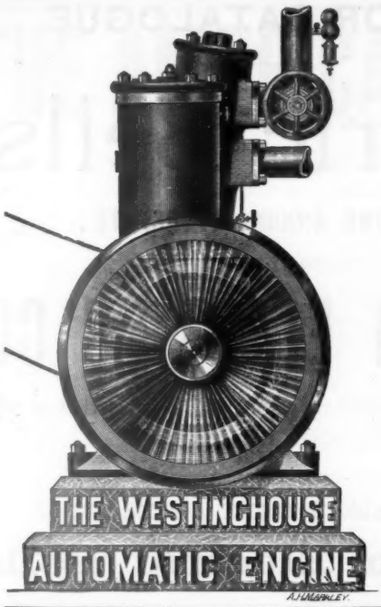

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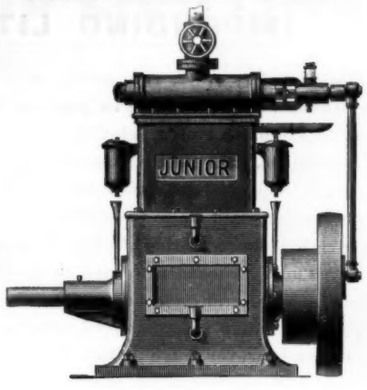

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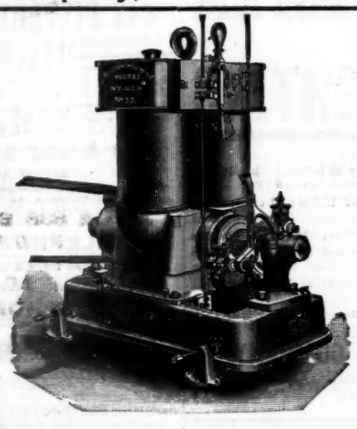

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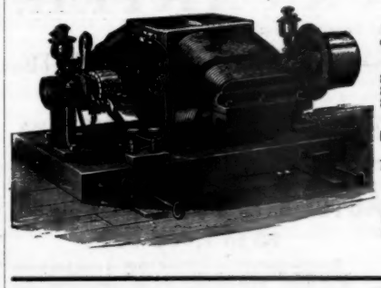

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On May 17, 1882, the public were cautioned against making investments in any scheme or venture based upon the claims of one Camille Alphonse Faure, relating to secondary or storage batteries or accumulators, and notice was then given that the Brush Electric Company, of Cleveland, were the rightful owners in this country of the inventions laid claim to by Faure and others, and were enforcing their rights by proceedings, before the proper tribunals of this government. Those proceedings have been pushed with diligence by the Brush people, and have been opposed and delayed in every possible way by the Faure interests and others, for a period of four years. Decisions, however, have at last been rendered in favor of the Brush interes, and patents have been granted to it covering the entire ground claimed by the Faure people, and the Faure patent is thus rendered valueless; twenty-seven patents, covering the field above referred to, and of cognate scope, have been granted to the Brush Electric Company, and one or more of them cover all the commercial batteries that have been up to now devised. The two principal and foundation patents, which control the use of the so-called Faure storage battery, as well as the Sellon-Volckmar battery, and others in ths country, and supersede the patent issued to Faure January 3, 1882, numbered 252,002, are dated and numbered respectively, March 2, 1886, No. 337,298, and March 2, 1886, No. 337,299. The public are again advised, as they were in 1883, of the rights of the Brush Electric Company, and that these rights will be enforced.

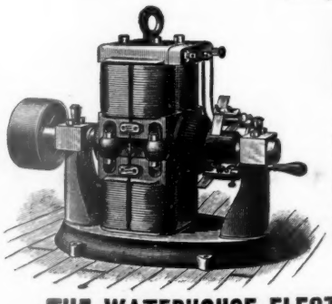
Particulars may be learned of the undersigned, or of William C. Witter, Esq., or William H. Kenyon, Esq., their counsel, 32 Park Place, New York.

BRUSH ELECTRIC COMPANY,
CLEVELAND, OHIO.

THE WATERHOUSE SYSTEM

—OF—

ARC LIGHTING



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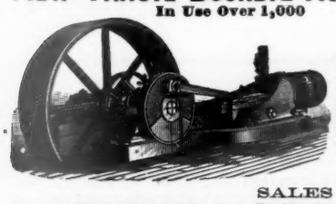

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Dynamo Machines with perfect automatic regulation, reliable and efficient.

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THE AMERICAN SYSTEM OF ARC LIGHTING.

COMBINATION OF GAS AND ELECTRIC LIGHT INTERESTS.

The *New York Daily Tribune* of November 16th inst. published an article upon this subject from which the following is copied:

NO MORE GAS WARS.

"Those who have heretofore entertained any doubts regarding the ultimate success of electric lighting as a solid business industry, and the "important position which its advocates have always claimed it would yet command in the commercial sense, have at last become convinced that "their skepticism upon this subject has been ill-founded.

"The enormous increase in the use of the arc light during the last year is exciting considerable attention in commercial circles. A some-"what significant and startling feature in the business is the fact that the more advanced and progressive gas managers are waking up to the "importance of the great strides now being made in the electric arc light field, and are now generally accepting the theories which have for the "last four or five years been so strenuously advocated by Mr. Edwards H. Goff, the founder of the American system of electric lighting, viz.: that "the genuine interests of the gas and electric light companies were identical, that they should work together as allies, instead of opposing each "other as common enemies.

"One of the strong points which Mr. Goff has always made in his arguments is that the increased use of the electric light would invariably "cause increased consumption of gas, particularly where the electric light was used for street illumination. Mr. Goff's ideas upon this did not at "first meet with any favor whatever with the gas or electric light companies, outside of his own, and were generally opposed and scouted, when-"ever discussed, until during the last few months. It seems that a complete revolution has taken place in the minds of the gas people, and now "many of the gas companies are adopting the electric light themselves for street lighting, and nearly all of the companies are seriously consider-"ing the matter.

"From a recent circular issued by the American Electric Manufacturing Company, of which Mr. Goff is president, it is discovered that two "wealthy gas companies have not only adopted the American electric light to operate in connection with their gas plants, but have actually become "general agents for the American Company in selling its apparatus. The companies alluded to are the St. Paul Gas Company, of St. Paul, Minn., "and the Citizens Gas Company, of Jacksonville, Fla. Mr. Goff certainly ought to feel that although his advanced ideas upon this subject did "not for a long time meet with any favor, the general adoption of them now by the gas companies as sound and business-like, is ample compen-"sation for his fidelity to the subject, especially as it is altogether likely that the gas interests of the country will naturally look to the originator "of this plan of business as their material and loyal ally.

"Several other gas companies in different parts of the country are already adopting the American system of electric lighting."

The AMERICAN SYSTEM of ELECTRIC ARC LIGHTING is the most EFFICIENT and DURABLE manufactured in this country. Its superiority over all other systems is acknowledged by users of ARC LIGHT apparatus, and by all disinterested experts who have examined it thoroughly.

The simplicity and durability of the American dynamo and lamps, and the annual saving in expenses and repairs of operating same, over that of all other systems, make it by far the cheapest and BEST system in existence.

SEND FOR CIRCULARS AND ESTIMATES BEFORE PUTTING IN AN ELECTRIC PLANT OF ANY KIND.

AMERICAN ELECTRIC MANUFACTURING COMPANY.

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OFFICERS:

EDWARDS H. GOFF, President and General Manager; L. M. BATES, Vice-President; H. E. IRVINE, Secretary and Treasurer; JAMES J. WOOD, Electrician.

GENERAL AGENCIES:

American Electric Construction Company, 146 Broadway, New York—New York State.
St. Paul Gas Co., St. Paul, Minn.—State of Minnesota.
Citizens Gas Light Co., Jacksonville, Fla.—State of Florida.
Sowdon, Elder & Wright, 131 Devonshire St., Boston.—New England States (except Connecticut.)
Pittsburgh Electric Company, Eugene Ingold, General Manager, 213 Wood St., Pittsburgh, Pa.—Western Pennsylvania, Ohio, Kentucky and West Virginia.
J. M. Chipman, 19 North Pennsylvania St., Indianapolis, Ind.—State of Indiana.
Markle Engineering Company, Detroit, Mich.—State of Michigan.

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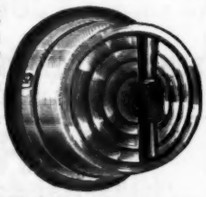

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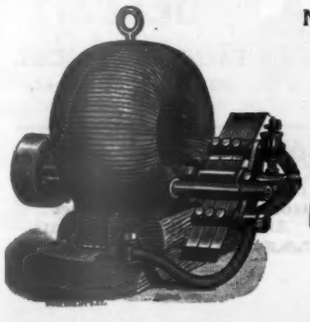

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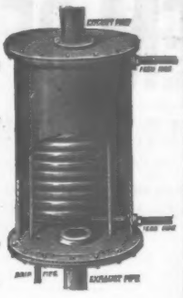

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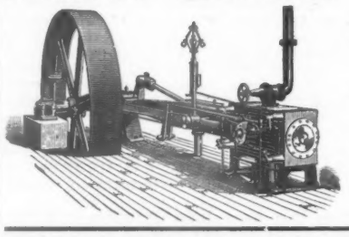

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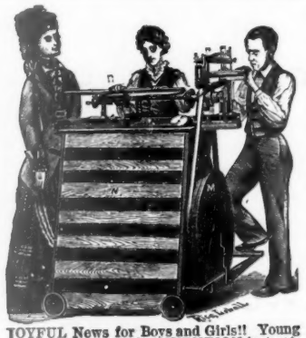

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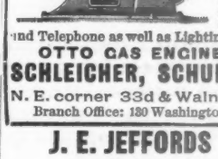

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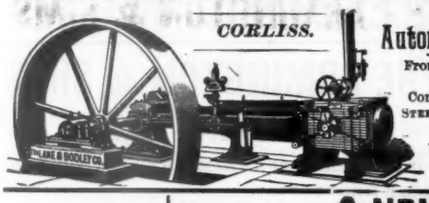

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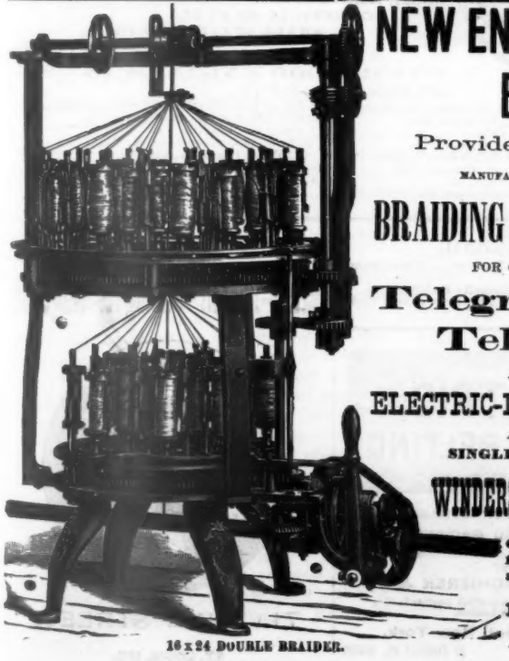

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